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BARE FALLOWS.

The practice of taking a bare fallow as a preparation for wheat was at one time almost a universal custom in farming. It was said to have been introduced into these islands by the Romans, and in mediæval times we find that the only rotation consisted of wheat, barley, fallow, with beans instead of barley on the stronger lands. In Scotland, where up to the eighteenth century it was the custom to grow corn crops repeatedly and then let the land lie in grass for a few years, the introduction of a bare summer's fallow, after the ley was broken up and before the wheat was sown, was one of the earliest improvements in the traditional system of farming. The thorough cleaning which the land received, and the marked improvement in the tilth which was effected, were strong arguments in favour of the practice; furthermore, experience amply demonstrated that better crops of wheat could be secured after a bare fallow than after a previous corn crop or a recently ploughed lea. The early theorists concluded that some fertilizing principles were absorbed from the atmosphere during the summer's exposure to sun and air, and, indeed, it became patent that the more thoroughly the soil was stirred and pulverized by the cultivations the greater was the benefit resulting from the fallow.

But towards the close of the eighteenth century the custom had begun to decline; green crops, and turnips in particular, had become part of the routine of farming, and the Norfolk husbandry, with its four-course system of turnips, barley, clover,

wheat, was spreading from the Eastern Counties all over Great Britain.

The more advanced farmers perceived the importance of keeping the land under crop ; by growing turnips it was possible to obtain all the advantages, in the shape of the cultivation and the stirring of the soil, which result from a bare fallow ; at the same time, food was provided for the stock and a much better kind of dung was made than when the straw was merely trampled down to get it into a state fit to go back upon the land. The writings of Arthur Young, who was Secretary to the then Board of Agriculture, in the early years of the nineteenth century, were unceasingly directed against bare fallows ; and his influence, combined with the numerous enclosures and the high prices prevailing during the Napoleonic wars, did much for the spread of turnip culture. The strong lands and the clays were still the difficulty ; on them it was often a costly and even an impossible operation to secure a good plant of turnips, but it became more and more a mark of careless farming to rest content with a bare fallow. Mecchi showed that the strongest Essex clays could be made to grow turnips, and with the spread of mangel cultivation it became possible to put even the most stubborn soils in the South and East of England under roots. The bare fallow still survived as an occasional operation once in seven or eight years, and many clay-land farmers maintained that it was a profitable operation, the benefit of which was felt for several years. Latterly, with the fall in corn prices and diminished rents, the acreage under bare fallow has again showed a tendency to increase. For instance, in Essex the bare fallow in 1866 amounted to 11·4 per cent. of the land under corn ; in 1904 it was 16 per cent. ; in Suffolk the bare fallow has actually increased, despite the diminution in the area of arable land, rising from 25,000 acres in 1866 to 30,400 acres in 1904.

A bare fallow is generally taken after a stubble crop, and the prime object is to get as many weed seeds as possible to germinate. A first ploughing in autumn will be followed by a cross-ploughing in the spring and two other ploughings in the summer. Sometimes the first ploughing is left until the spring corn has been sown, and is followed by two or even four plough-

ings during the summer. The harrow is used after each ploughing to collect the weeds, and many farmers roll the land to reduce the clods and promote the germination of the weeds. But on many soils it is desirable to avoid getting too fine a tilth, lest heavy rains cause the land to run together and the surface to set to a hard crust. To this danger the heavy loams and clays with an admixture of fine sand are more liable than the clays proper.

A bare fallow may exert a beneficial effect on the land in three ways—by cleaning the land of weeds, by improving the texture of the soil, and lastly by increasing its fertility. The continued cultivations and repeated draggings will rid the land of couch; at the same time annual weeds are germinated and destroyed by the next ploughing. It may be said, however, that with reasonable farming land should never get so foul as to require a bare fallow to clean it, and we find among the clay-land farmers that their chief justification for a bare fallow lies in the great improvement in the texture of the soil that results. A clay soil is in the main composed of very fine particles, which, to a certain extent, bind themselves loosely together and act as larger particles. Any knocking about of the soil when wet breaks up these little groups into their constituent fine grains, thus increasing both the holding power of the soil when wet and its tendency to dry to a hard clod. Exposure to the weather, on the contrary, freezings and thawings, alternate dryings and wettings, unite the particles again and lighten the texture of the soil. With the best of management the texture of heavy clay land tends to deteriorate under cultivation, and the rest it gets by lying under grass for a year or two, or from a summer's fallow, is necessary from time to time to get the soil back into a good working condition. The improvement persists for three or four years and forms the main reason for taking a bare fallow nowadays, for good crops, particularly of roots, depend more on the tilth of the seed-bed than on any other single factor in farming.

Many have been the theories as to whether the land gained or lost fertility through a summer's fallow. Thaer, who was an authority about the beginning of the eighteenth century, wrote: "There is no doubt that the fallow absorbs or attracts the

fertilizing properties of the atmosphere." Arthur Young, on the contrary, with his aversion to bare fallows, wrote about the same time: "The quantity of gas or vapour that is hourly exhaling from a fallow field after rain or every fresh ploughing is improvidently lost, and argues a want of economy that is truly reprehensible." But experience was against Arthur Young; the practical farmer knew that cultivation by itself made the land better able to support a crop; this was the basis of Jethro Tull's horse-hoeing husbandry and of the Lois-Weedon system of alternate husbandry. Anybody, again, who visits an experimental farm, where the plots are separated by paths, will recognise the "fallow effect" in the increased vigour of the outside rows bordering the bare soil. An explanation, however, was not possible until the discovery of nitrification some twenty years ago and the investigations which have been made into the conditions favouring the process.

All soils contain considerable residues of nitrogenous material which cannot reach the plant until they have been oxidized by various bacteria in the soil and so converted into nitrates. A summer's fallow provides just the conditions favourable to nitrification—warmth, aeration, the stirring of the soil, and the greater amount of moisture which results from the absence of a crop to dry the soil.

It is easy to ascertain that the fallowing results in a great gain of water to the soil; for example, at Rothamsted in 1904, half of certain plots were fallowed while the other halves carried wheat. The soil was sampled in mid-September, after harvest, with the following results:—

				Percentage of water in fine soil.	
				Cropped.	Fallow.
1st depth of nine inches	...	...		17'4	17'2
2nd "	"	"	...	18'8	20'0
3rd "	"	"	...	20'1	22'3
4th "	"	"	...	20'9	23'1

or down to the depth of 3 ft. an average gain of 1'35 per cent. of water equivalent to 3'1 in. of rain. Of course, in a climate like ours this extra water is a matter of little or no moment,

since the land becomes saturated repeatedly by the winter rainfall, but in more arid countries it often makes all the difference to the crop. In parts of California, for example, it is possible to take a crop like wheat only every other year without irrigation, the bare fallow in the intermediate years being necessary to collect the rain for a full yield.

The chief gain, however, from a summer fallow lies in the way the nitrates are made and stored up in the soil for the benefit of the ensuing crop. The Rothamsted experiments illustrate the increase thus produced, for there one plot grows wheat every year without manure, and the second is divided into two portions, one of which is fallowed while the other is cropped every alternate year. The yield is as follows:—

-----	Wheat every year.		Wheat after fallow.	
	Grain.	Straw.	Grain.	Straw.
	Bushels.	Cwt.	Bushels.	Cwt.
Average crop per acre per annum, 1856-1902,	12.7	10.0	17.1	14.2

This shows a considerable gain for fallowing, but it must be remembered the land in the second case is only cropped every other year, hence the production per acre under cultivation is only half as much, or $8\frac{3}{4}$ bushels per acre per annum.

As the benefit of fallowing depends upon the formation of nitrates during the summer and their retention for the next crop, it follows that heavy rain during the winter may wash them entirely away and leave the land no richer. This fact is plainly seen if the results given above are divided into two groups according as the autumnal rainfall, September to December inclusive, is above or below the average:—

-----	16 Seasons of less than average rainfall.	16 Seasons of more than average rainfall.
Rainfall (Sept.—Dec.)	8.88 in.	13.66 in.
Percolation through 60 in. soil ...	4.03 in.	8.92 in.
Total produce (wheat after wheat) ...	1,810 lb.	1,627 lb.
Total produce (wheat after fallow) ...	2,743 lb.	1,757 lb.
Percentage increase due to fallow ...	51.5	7.9

Thus, when followed by a dry autumn, the fallowing produces an increase of more than 50 per cent. in the ensuing crop, whereas if the winter be wet the increase due to fallowing is little or nothing.

It therefore follows that summer fallows are only likely to be of direct benefit to the next crop where the climate is dry and no great amount of percolation takes place through the soil in the winter. It is, on the whole, more likely to result in a permanent loss of fertility, and can only be justified on those heavy soils which need an occasional rest to maintain their condition and restore a good tilth.

Another of the Rothamsted experiments illustrates how much may be gained by a clover crop in place of a bare fallow. One of the fields is farmed under a four-course rotation—swedes, barley, clover or fallow, wheat; one half of the plots growing clover and the other fallowed before the wheat. The better the clover the better the ensuing wheat, and if we compare the succeeding crops after a good clover year its benefits are very marked:—

----				Clover Hay.	Wheat	Swedes.	Barley.
				Cwt.	Bushels.	Tons.	Bushels.
Clover plot	...	...	...	76·7	39·5	19·4	36·3
Fallow plot	...	...	...	—	32·5	19·0	28·3

Although nearly 4 tons of clover hay were removed, the residues, roots and stubble were sufficient to increase the wheat crop by 21 per cent.; the root crop which came next by 2 per cent., although the same manure was put on both crops; and finally the barley, three years after, by 28 per cent.

From all these results it will be seen that a bare fallow can never be a directly profitable operation and has no justification on free working land. But with strong clays in dry climates, as for example over much of the East and South-East of England, it may often be necessary to clean the land and restore its friable texture; on such soils also there is least likelihood of loss through the washing out of the reserves of nitrogen which have been rendered available by the process.

A. D. HALL.

WHITE AND ALSIKE CLOVER SEED AND THEIR IMPURITIES.

Trifolium repens, white clover, is also called Dutch clover, a name given because it was first collected and cultivated as a seed crop in Holland and thence exported to other countries. Though indigenous throughout Europe, it was not until about the beginning of the eighteenth century that it was sown as a field crop in this country. It differs from red and Alsike clover, inasmuch as its habit of growth is low and widely creeping, but is similarly provided with a well-developed tap-root, which enables it to persist and hold its own during a dry scorching summer, while at the same time its prostrate, creeping stems, which give off adventitious rootlets at the nodes, feed mainly, if not entirely, in the upper layers of soil. It may doubtless be largely owing to this peculiar rooting habit that white clover can withstand the English climate and is very much less susceptible to climatic changes than red clover. The power of accommodating itself to a great variety of soils and situations may also be due to the same cause.

The roots of white clover, in common with other clovers, possess an advantage over other plants in that they have the power under certain conditions—even when grown in soils destitute of nitrogen—of manufacturing albumenoid substances. Hellriegel was the first to discover the true significance of the warts or nodules on the roots of the Leguminosæ, and ascertained that the nodules contained innumerable nitrogen-fixing bacteria engaged in manufacturing the elementary nitrogen of the air into compounds, which are made use of by the host-plant in building up the necessary albumenoid substance.

White clover is found in abundance in all the best pasture land in the country, helping materially, in conjunction with some of the finer grasses, to form a close-bottomed grazing turf of high quality; it is also considered essential and specially valuable on pasture land intended for sheep grazing. In many districts we can recognize two varieties growing in the fields: one, the ordinary white clover of commerce, characterized by its more robust habit of growth, the other a smaller-foliaged variety indigenous to the soil. The seeds of the latter are occasionally offered at Mark Lane as wild white clover, but as there is not apparently

any difference between the seeds of the two kinds, it cannot be in any sense guaranteed true to name.

White clover seed should be used in all seed mixtures for permanent pasture and in leys of temporary duration ; when they are to remain down for more than one year, though the yield is small, it is much more permanent than either red clover or Alsike. Some of the weed seeds (see illustration p. 9) common both to white clover and Alsike are here represented magnified six diameters :—Sheep's sorrel (*Rumex Acetosella*), round-leaved Cranesbill (*Geranium molle*), Ox-eye daisy (*Chrysanthemum Leucanthemum*), Goose-foot (*Chenopodium album*), Poppy (*Papaver Rhæus*), Field pansy (*Viola tricolor*), Chickweed (*Cerastium triviale*), Pepper grass (*Lepidium virginicum*), the latter fairly common in American seeds. Ordinary rib grass, as illustrated in the article on red clover,* is also found in more or less abundance in many samples of white clover and Alsike.

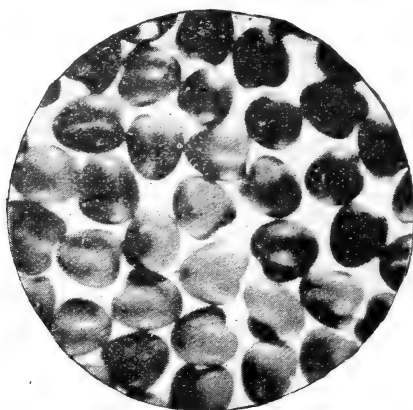


FIG. 1.—WHITE CLOVER (plump, uniform sample ; magnified seven diameters).

The seeds of dodder are rarely found in white clover.

The seeds of white clover are somewhat similar in shape to those of Alsike (see illustration p. 9), though slightly smaller. They are heart-shaped in appearance, and in new fresh seed the bright sulphur or orange-yellow colour is a characteristic feature. Seeds, which are reddish-brown, broken, thin, weevil-eaten, and imperfectly developed, are a fairly common feature of medium or low grade samples.

It is possible, as a rule, to estimate pretty accurately the in-

* *Journal*, March, 1906, p. 718.

*Sorrel**Ox-eye daisy**Goosefoot**Round leaved
Cranesbill**Poppy**Peppergrass.**Trifolium repens*
White Clover.*White Clover.**Alsike.**Trifolium Hybridum*
Alsike.*Field pansy**Chickweed.*

SEEDS COMMONLY FOUND IN SAMPLES OF WHITE AND ALSIKE CLOVER SEED
(Each seed drawn to scale and magnified six diameters)

trinsic value as well as the commercial worth of a sample by its appearance alone. If the seeds in bulk are uniformly of a fair even size, fresh and of a bright yellow colour, with only an occasional brownish seed, it may fairly be assumed that the seeds are new and at least of average germination; on the other hand, seeds which fail to respond to the germinating test have, in all probability, suffered by the weather conditions during the latter period of ripening and harvest, or are old or immature owing to one or other of the two first-named conditions. The colour of some of the seed may have changed from a yellow to a dark red or brown; the greenish-yellow tinge in others is direct evidence of the lack of perfect development. The fraudulent sophistication of white clover seed, either by rubbing with sulphur or by the application of the fumes of sulphur dioxide, in an attempt to restore the original or normal light tint lost by age or weathering, is now entirely a thing of the past, at least so far as the experience gained in handling many thousands of samples enables the writer to judge. In the hands of the expert all farm seeds are roughly divided into two classes, root seeds and cereals forming one, clover and grass seeds forming another. In the first division it is absolutely necessary to know the pedigree and character of the stock before any estimate of the *true* value of the purity and germinating test can be arrived at. It is quite possible for a sample of root seeds to germinate 100 per cent., but if the stock from which it is produced is of poor quality, it may be of much less value than the seed of a good stock germinating 50 per cent. In the second class, viz., clover and grass seeds, the purity and germination alone, with a knowledge of the country of origin, are sufficient to determine its value.

A good sample of white clover should at the very least have a purity of 96 per cent., and the standard of top-price quality should be 98 or 99 per cent.

The progressive up-to-date farmer, who tests the purity and germination of the clovers and grasses he sows, should never, under any circumstances, be satisfied by the germination test alone, for to the uninitiated it is entirely misleading. To take a case in point: the germination has been tested perhaps at a seed laboratory in this country, or at one of the seed stations on the Continent, and reported at 95 per cent. Though this re-

port is comparatively high, the sample as a whole may be of third or fourth rate quality, one-third or one-half the purchase may be absolutely rubbish or, what is worse, living weed seeds, as it is the pure and apparently good seeds only that are tested. The combined test of purity as well as germination is the only key or guide to the real cultural worth of any sample; thus

$$\frac{\text{Purity} \times \text{Germination}}{100} = \text{real value, or the pure germinable seeds}$$

in the sample.

The enterprising farmer who has his seeds tested and analysed before sowing may reasonably demand the maximum of information on the certificate of purity he receives from the analyst. The purity of any sample is always calculated and entered on the certificate as percentage by weight; this should have coupled with it the name and number of different weed seeds found in a given quantity, say 1 gram or 1 ounce.

It seems scarcely credible that a sample of white clover recently examined by the writer, though apparently good and having a purity of 97 per cent. by weight, contained when the weed seeds—sorrel, geranium and chickweed—were counted 5,300 weeds in one ounce, and that one pound contained the amazing total of 84,800 weeds, yet the sample was comparatively pure by weight. On the other hand, it is not at all unusual to find samples containing five times the amount of impurity by weight and yet not one-hundredth part the number of weeds enumerated above. The impurities present may in the main be harmless mechanical impurities, such as soil, vegetable débris, &c., or they may be living weed seeds, the latter, of course, being by far the more objectionable.

Apart from the use of comparatively worthless low quality seed, white clover is rarely or ever adulterated, perhaps with the exception that, when the seed is scarce and prices rule high, an admixture of suckling clover is sometimes used, and, unless the sample is closely scrutinized, it is not readily seen, as the seeds are similar in colour. When examined, however, under a low-power lens, the difference between the seeds is easily recognised, the seed of suckling clover being somewhat cylindrical in shape and very shiny (see Fig. 2), while the white clover is heart-shaped.

The farmer, if he is willing to pay a fair price, need have no difficulty whatever in obtaining good seeds which are, comparatively speaking, pure and entirely free from noxious impurities, and which are of high germinating capacity. Should he be alive to his own interests he will not grudge time or money in attaining this object, for the best only is good enough for sowing purposes. By paying a fair price and using reasonable precautions he can secure high germinating capacity, ranging perhaps from 94 per cent. to 98 per cent.

In the germinating test rapidity of growth is taken into consideration, and in the case of white clover the growing energy of the seed is noted on the third day, while the growing test is finished on the tenth day.

Trifolium hybridum (Alsike clover) derives its common name

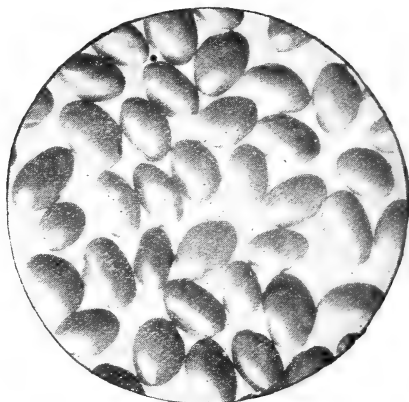


FIG. 2.—SUCKLING CLOVER (sometimes used to adulterate white clover; magnified seven diameters).

from the fact that though indigenous to Southern Europe it was first introduced into this country from the village of Alsike, in Sweden, about seventy years ago. The specific name of *hybridum* was given to it by Linnæus, who regarded it as a cross between red and white clover.

The colour of the flower-head—the outer florets of which are tipped with purple or pink—imparts to the plant the appearance of an intermediate form between red and white, no doubt giving rise to the supposition that it is a cross, but on this point opinions are divided, for, notwithstanding the whitish-pink colour of the flower-head, it is now believed to be a distinct species.

Alsike clover is truly perennial in character and useful for both temporary and permanent pasture. It attains its maximum yield on moist loams and clays, and is favoured rather than otherwise by wet seasons. Of all clovers it is the only one suitable for irrigation. Owing to its surface-rooting habit the yield on light dry land is correspondingly meagre ; on land suitable to its development it is more permanent than red clover, and superior to white clover by its upstanding leafy growth, which enhances both the quantity and quality of the hay crop. In pasture land the tread of cattle affects its growth but slightly, if at all, and after depasturing, new shoots quickly spring into growth. It stands heat and cold, and on clover-sick land, which

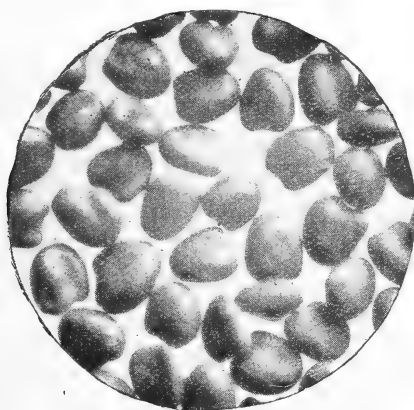


FIG. 3.—ALSIKE CLOVER (good sample ; magnified seven diameters).

is unfavourable to a healthy crop, it is indispensable as a substitute for red clover.

The seeds of Alsike (Fig. 3) contain in most instances the impurities common to white clover, perhaps with the striking exception that while dodder is but seldom found in white clover, it is not unusual in Alsike. Samples of Alsike containing dodder very frequently exhibit a peculiar sickly greenish hue, and this leads one to think that the development of the seed has been interfered with by the ravages of the parasite which has robbed the plant of its food. At all events, lightish green, immature samples of Alsike should be closely scrutinized for dodder seeds.

The vitality of seeds and their value and power to grow and produce a healthy and robust crop are largely dependent upon

the degree of maturity when harvested. It is well known that differences may exist in the maturation of clover seeds from the same plant, or even from the same flower-head, fertilization taking place at different times. When harvest time arrives, even a small patch of clover may exhibit many instances of interference with the development of the embryo, and the sample will consequently contain a considerable proportion of thin, immature, and comparatively worthless seed. If this is so in a small lot, produced with care and from one source, it is much more likely to be the case with many large consignments of seed from America and the Continent of Europe. The seeds are grown perhaps in districts widely apart and under differing conditions; the different lots are bulked together at the port of shipment, and carried thence to the English market. When the consignments come into the hands of reliable seed merchants the seeds are subjected to a process of cleaning by the aid of a somewhat expensive system of fanning, sifting, and grading, to remove obnoxious weed seeds, thin and immature grains, and mechanical impurities, and when this is done a very superficial examination discloses the quality of the sample. Though the cleaning process is in the best interests of the farmer, it necessarily entails cost and raises the price, but a thoroughly well-cleaned sample is likely to be the cheapest in the end.

Alsike as well as white clover is grown for seed purposes in England, Germany, and Austria, but very frequently Continental-grown seed, unless of the highest quality, contains a great variety of weed seeds, and especially the much-dreaded dodder.

Though of recent years there has been an apparent decline in the purity of American-grown seed, it still, nevertheless, holds good that some of the purest and best samples on the English market are grown on the American Continent—Canada and the North-Western States producing a considerable quantity of the highest grade seed.

The seeds of Alsike, like white clover, are heart-shaped, and in good samples should be plump and uniform. The colour is very variable in different samples, and even in the same sample there may be dark green, yellowish-green, and pale green seeds; alternate shades of light and dark green in many cases give the seeds a somewhat marbled appearance, which is characteristic of

many samples. The variations are largely due to the maturity or the ripeness of individual seeds, yellowish-green indicating immaturity, and brown or reddish-brown advancing age or weather influence about or during harvest time.

Unless we look upon the presence of a high percentage of weeds and other rubbish as adulteration, Alsike cannot be said to be often adulterated. But Alsike sometimes contains a considerable proportion of the seed of timothy, white clover, suckling clover, and trefoil.

The purity and germination of good samples should be similar to that of white clover.

While of recent years farmers have become much more alive to the necessity of buying their seeds with care, the fact remains that there are many tons of absolute rubbish sold annually in country districts under the misleading name of seeds.

D. FINLAYSON.

POTATO GROWING.

The following account of potato growing is based mainly on the results of experiments conducted throughout Yorkshire under the auspices of the University of Leeds and the Yorkshire Council for Agricultural Education.

Potatoes are grown successfully on many kinds of soils, but a sand of good "body" or a medium loam is best adapted for the crop. With regard to its place in the rotation there is no fixed rule; in most cases, however, potatoes follow corn. Occasionally they are grown after "seeds," which, as a preparatory crop, has many points in its favour. The decaying vegetable matter furnished by the sod is valuable not only as a source of food for the plant, but also on account of its beneficial influence on the physical condition of the soil.

The habits of the plant demand a good tilth. The land, therefore, should be ploughed deeply in autumn and cross-ploughed, if possible, in early spring.

Seed.—On the character of the seed tubers largely depends the success or failure of the crop. In many parts of the country it is the practice to plant small tubers, the bigger ones being sold for cooking purposes. There is considerable diversity

of opinion as to the best size of seed to plant ; some prefer large tubers, whilst others assert that equally good results will be obtained from small ones. Now, in discussing their cropping capabilities, two kinds of small potatoes must be considered : first, the late-formed tubers of strong, robust plants ; secondly, the produce of plants of low vitality. If the bulk of the seed consists of the former, then quite satisfactory returns will be got, as the tubers are small simply on account of their having had insufficient time to reach full size ; the remainder of the seed, however, will be small potatoes, the stunted produce of weakling plants, and from such only weakling tubers can be expected, practically all of which will fall into the seed class. Whilst it may be possible, therefore, to obtain a good crop the first year from small seed, owing to the likelihood of its being made up largely of tubers formed late in the season, the chances are that if seed from the same stock be used for a number of years in succession, there will be an ever-increasing proportion of the produce of weakling tubers, with the result that the returns will become more and more unsatisfactory.

Experiments show that, as sets, whole tubers about the size of a hen's egg generally prove the most profitable. Should the supply of whole seed run short it is unwise to make good the deficiency by cutting seed-size tubers. No reduction in yield, however, need be feared from sets obtained by cutting bigger tubers. With this class of cut sets the weight planted per acre may be considerably greater than when seed-size potatoes are planted whole, but, on the other hand, the produce will generally contain a less proportion of "small" than the produce of whole seed.

Planting should be done soon after cutting, and the sets covered with as little delay as possible. Exposure even during the dinner hour may be sufficient to reduce materially the yield from cut sets.

Liming the Cut Surface.—When, however, seed has to be prepared some days in advance of planting, the tubers, as soon as cut, should be dipped into finely-powdered lime. The effect of the lime is to form a "scab" over the wet surface of the set, which prevents, or, at any rate, considerably retards, evaporation of moisture.

Storing of Seed.—During the past four years different methods of storing seed have been tested, and the practicability of growing in the later districts considerably larger crops than formerly has been clearly demonstrated.

(1.) *Boxing in Autumn.*—According to this method, which has been largely adopted for some years by the growers of early potatoes, seed-size tubers are placed in the autumn in shallow boxes containing no soil or other material, and stored throughout the winter in tiers in a cool, well-ventilated and well-lighted shed. No artificial heat need be used. From time to time the order of the boxes in the tiers should be reversed so as to ensure an equal amount of light to all the potatoes. This treatment leads to the “greening” of the tubers and the development of short, sturdy, green sprouts. It is a method, however, that involves a good deal of labour at a time when work presses, and, further, accommodation for boxes is often lacking on farms at this season of the year.

(2.) *Boxing in Winter or Early Spring.*—This method permits of tubers being “pied” straightway in autumn and transferred to boxes in winter or early spring, whenever weather conditions are suitable and men can be spared for the work. The question of accommodation also and of protection from frost is not so serious in spring.

It is satisfactory to know that quite as good crops have been grown from seed stored in the latter way as in the former.

“Greening” of the tubers, which is secured by the first method, has evidently no influence on the yield—the main thing seems to be the removal of the seed from the pie or clamp before sprouting has much developed.

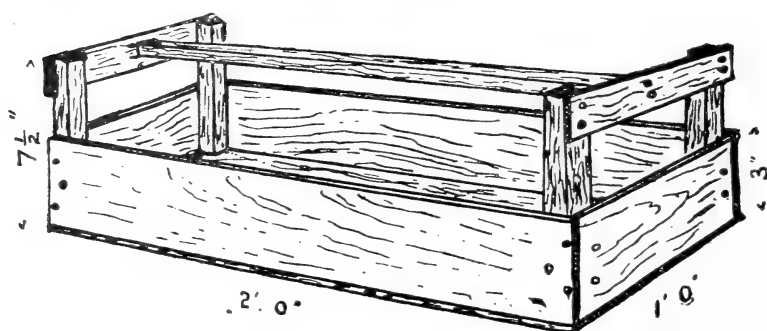
A very convenient box is the one shown on p. 18. From 100 to 120 of these will be required per acre, and the cost may vary from 30s. to 40s. per acre. The boxes should last several years.

(3.) *Pieing in Autumn and Planting direct from the Pie.*—Both of the methods just described have proved superior to the ordinary one of planting direct from the pie. All three were first compared in 1903. For the test in that year the variety planted was Up-to-Date, and an advantage of 2 tons per acre followed the use of boxed seed. In 1904 five varieties (second early and late) showed an advantage of 33 cwt. per acre in favour of boxed seed. In 1905 an average increase of 1 ton per acre was produced at Garforth by seven varieties.

All these results have been obtained from Scotch seed grown in Yorkshire for the second time only, and this notwithstanding the fact that Scotch seed is generally at its best in England in the second year.

It must, however, be stated that in each of the trials the potatoes were planted in May. From further experiments it would seem that as great advantages are not obtainable in districts where planting is possible about the beginning of April.

If potatoes can be planted sufficiently early so that the growth of the first sprouts takes place in the soil, then boxing of *late* varieties, at all events, is probably unnecessary. That loss, however, is suffered when potatoes have sprouted to a considerable extent in the pies is unquestionable. Such potatoes cannot be handled without many of the sprouts being damaged,



and if riddling is resorted to in order to separate seed from ware, the damage is still more aggravated; reduction in yield is bound to follow, and it only requires a simple test on the part of the farmer to convince himself of the truth of this statement.

Of course, there is the obvious objection that where large areas of potatoes are planted it is difficult to provide sufficient boxes for the seed and accommodation for them, but it ought generally to be possible to box the earlier sprouting varieties. If it be found impracticable or unnecessary to box the seed of late or maincrop varieties, it is at least preferable to spread it in a thin layer on the floor of a dry, well-lighted shed to leaving it in the pie till planting time.

The free admission of light is important. It has the effect of producing a slow, sturdy growth of sprouts which are much less liable to be knocked off at planting time than the pale, elongated sprouts produced in the dark.

In addition to minimizing the damage to sprouts, early removal of the seed from pies is beneficial for another reason. Rotting frequently takes place in the pie, sometimes to an alarming extent, and sprouts which have come into contact with rotten tubers are often considerably damaged, and not infrequently killed. Rotting may be checked by dusting the tubers freely with quicklime before pieing.

Change of Seed.—Too much stress can hardly be laid on the importance of this point. New seed is unquestionably more disease-resisting than seed that has been grown on the same farm for a number of years, and to secure the biggest crops, apart altogether from the question of disease, it would seem to be necessary to introduce new seed frequently. At Garforth, in 1903, *new* seed of four well-known varieties, viz., British Queen, Challenge, Conquest, and Eightyfold, produced, on the average, better crops by 3 tons 9 cwt. per acre than seed from stock which had been grown *four* times without change. Moreover, the crops from the new seed contained no disease, whereas on the average 22 per cent. of the crops from the older seed was diseased. In both cases the seed was procured from Scotland.

The following results, also from Scotch seed, seem to indicate that it may be profitable to change the seed after the *second* year :—

Name of variety.	Yield per acre.			Diseased tubers per acre.	
	Second year on farm	Third year on farm.	Balance in favour of the newer seed.	Second year on farm.	Third year on farm.
British Queen ...	T. c. q. 12 19 0	T. c. q. 11 13 1	T. c. qr. 1 5 3	lb. nil.	lb. 160
Conquest ...	12 7 1	9 10 3	2 16 2	120	1,200
Royal Kidney ...	12 2 2	11 11 2	0 11 0	nil.	40

Results obtained at other stations in England furnish additional evidence with regard to the benefits to be derived from frequent changes of seed, especially from Scotland, but there are grounds for believing that changes from different parts of England will also be beneficial, especially if the seed has been grown on soil different in character from that on which it is to be planted.

It is well to point out that new seed should be obtained as

early in spring as possible, before sprouting has commenced, so that the damage which sprouted potatoes suffer in course of bagging and transit may be avoided.

Scotch Seed.—That Scotland affords a good change of seed for England is undoubted, but why this should be so is not quite clear. A number of influences are probably at work. The growth of potatoes in many parts of Scotland is frequently interrupted by autumn frosts, and the crops are lifted before they are as well matured as the crops in many parts of England. Now if the foliage of potatoes is damaged by frost or some other influence before the tubers have attained their full size, there will be fewer big potatoes in the produce, and, consequently, a better selection of seed will be possible. In other words, a farmer will be using for seed a certain proportion of tubers which, had they had time to reach their maximum growth, would have passed to the market as ware or saleable stuff. It is possible that a big potato has more "constitution" than a small one, and, consequently, a small potato not yet arrived at its full growth—in brief, *immature*—may contain more innate vigour than a small yet fully mature potato that may have been the produce of a weakling. Granting, then, that the proportion of ware is greater in English- than in Scotch-grown crops, it is only reasonable to suppose that the proportion of stunted weakling tubers is the greater in the English-grown seed. Moreover, the proportion of such tubers will tend to increase from year to year, since the practice of retaining for seed small potatoes insures that practically the entire produce of weakly plants falls into the "seconds" or seed-size class.

This may to some extent explain why in England it becomes necessary to change the seed so frequently and why Scotch seed does so well in England. There is yet another point, however. In spring the Scotch seed is slower in sprouting than the English, and therefore runs less risk of damage.

Immature Seed.—To throw further light on this point a test of immature seed was made in 1905, seed of a number of varieties was lifted in 1904 (1), in *immature* and (2) in *mature* condition. To obtain seed in an *immature* state small quantities of a number of varieties were lifted whilst the tops were still green and the skins of the tubers tender.

For the *mature* seed the same varieties were lifted at the usual time, when the tops were quite dead and the skins of the tubers tough. Two varieties, grown for the third time on the farm without change of seed, showed an average advantage of 24 cwt. per acre in favour of immature seed, while three others, grown for only the second time on the farm, gave practically no advantage with immature seed. The stock from which the varieties were grown was obtained from Scotland.

Immature seed, however, can be better obtained by planting a late patch of potatoes, say some time in June. The produce from such will be mostly composed of "seed" and "small," and seed obtained in this way seems to be well adapted for storing even under the ordinary pie conditions. Immature seed, obtained by the other method described, is not well suited for storage in pies.

Choice of Variety.—Success or failure in potato growing is determined largely by the choice of variety. The seed may be in first-class condition, the soil and manures also may be the same for all, and yet one variety may yield tons less per acre than another. In testing varieties of potatoes it is especially important that the stock from which the seed for the test is drawn should have been grown under the same soil and climatic conditions.

The value of a variety should not be gauged solely by its cropping capacity. Cooking quality is a very important point, and although this is largely dependent on soil and season, yet the results obtained on the medium loam soil at Garforth will, it is believed, be found to agree in great measure with the results obtained in other parts of the country. Further, disease-resisting power is a most important consideration, and so also is the natural tendency of the variety to form tubers the bulk of which are big enough to be put upon the market as ware. This, fortunately, can be controlled to a certain extent by using cut sets. Then, again, choice of variety must be governed by the demand of the market. There are many good coloured varieties, but the demand for such in city markets is comparatively limited, and it certainly pays best to grow only those that will meet a ready sale. Out of a large number of varieties tested in Yorkshire and elsewhere during the past five years,

the following may be taken as best fulfilling all the conditions above stated :—

Earlies.—Ringleader, Harbinger, Recorder, Sir John Llewellyn.

Second Earlies.—British Queen, Conquest, Royal Kidney.

Late or Maincrop Varieties.—Up-to-Date, Charles Fidler, Evergood.

Doubtless there are many other excellent kinds, especially of the Up-to-Date type, but the above are more or less typical of the different classes.

MANURING OF POTATOES.

Probably no crop that a farmer grows receives more manure than the potato crop. Although, in most cases, the plant responds readily to liberal manuring, it is doubtful if it be a greedier feeder than other “fallow” crops. It should be borne in mind that the largest possible crop is not always the most profitable, and that an excess of manurial ingredients over the requirements of the crop may lead to considerable waste. It may be argued that any such excess will benefit future crops, but the farmer wants the highest possible return on the first crop—“residual value” being generally a more or less doubtful asset.

In manuring potatoes a certain amount of dung is always beneficial. It may be applied at different periods of the year, but most experiments show that spring applications give the best results. A dressing of 20 tons of dung per acre is not uncommon, and sometimes a liberal quantity of artificials is applied in addition. With such treatment big crops may often be obtained, but it frequently happens that the foliage is encouraged at the expense of the tubers, and actually heavier and, of course, much more profitable, crops may be grown by using half the above quantity of dung. If the land be in very poor condition, 20 tons of dung may prove more profitable than 10, but in the majority of cases quantities like the former are too large to be applied with profit.

A more common system, however, of manuring potatoes is that of applying a moderate dressing of dung—say about 10 tons per acre—and supplementing with artificials. In the use

of the latter along with dung caution is necessary; it is believed that artificials are frequently applied in excess of the requirements of the crop, and that, in consequence, smaller profits are obtained than when more economical methods are followed.

When crops of from 9 to 10 tons per acre can be grown solely by the aid of moderate dressings of dung there is a risk that any increase in yield obtained by the use of artificials in addition may be produced at too great a cost.

The following mixture of artificials per acre may be recommended as a safe and reliable one under most circumstances, and no farmer should use artificials in greater quantity along with 10 tons of dung until he has thoroughly satisfied himself that it can be done with profit:—

1 cwt. sulphate of ammonia.

2 cwt. superphosphate.

1 cwt. sulphate of potash.

Sulphate of Ammonia v. Nitrate of Soda.—When used along with dung there is generally little to choose between these two sources of nitrogen, but when no dung is used the results are mostly in favour of sulphate of ammonia.

Different Potash Manures.—Sulphate of potash, in most cases, will give the best results, but there is so little to choose between the sulphate and the muriate that a farmer in purchasing should be guided by their respective unit prices.

Both these forms have proved superior to kainit. There is an idea prevalent amongst farmers that kainit, owing to its attractive power for moisture, is superior to the other forms on sandy or light soils, especially in a dry season. This, however, has not been borne out by the Yorkshire experiments.

Rape meal, as a manure for potatoes, is held in high favour in districts where the soils are of a light character. It contains about 5 per cent. of nitrogen and 3 per cent. of phosphate, and, like most organic manures, decomposes slowly in the soil. In experiments conducted in 1905, 2 cwt. per acre, applied along with $\frac{1}{2}$ cwt. sulphate of ammonia, 1 cwt. sulphate of potash, and 10 tons dung, gave very satisfactory results on light soils in Yorkshire.

The Effect of Artificials when no Dung is Applied.—Although dung is generally regarded as essential in the manuring of potatoes, very good and highly profitable crops can be grown without it.

The following mixture of artificials per acre may generally be depended upon to produce as big a crop of potatoes as 10 tons of dung :—

2 cwt. sulphate of ammonia.

4 cwt. superphosphate.

2 cwt. sulphate of potash.

Dung, when readily obtainable, will doubtless prove more economical than the above mixture of artificials, but there are times—*e.g.*, after “seeds”—when such a mixture alone will give quite as profitable returns as 10 tons of dung.

Time of Planting.—Potatoes should be planted in spring, as soon as a good tilth can be obtained. April is generally a suitable month, but sometimes planting is possible about the end of March, and not infrequently good returns are obtained from seed planted in May. When no special precautions, however—such as boxing—are taken to preserve the first sprouts, it is advisable to plant the potatoes so that, as far as possible, they shall make their first growth in the soil. A good covering of soil will protect the sets from frost, even when planted as early as the end of March, but as soon as the weather becomes fairly mild part of the covering should be removed by harrowing, as weak and spindling sprouts result if they have to push their way through a considerable thickness of soil before reaching the light.

Depth of Planting.—As to the proper depth to plant, a great deal depends upon the character of the soil. Where the soil is loose and friable it is possibly advantageous to plant fairly deep. When dung is applied in the row the danger of the sets being covered too much is minimized, but when potatoes are planted without dung in the row there is considerable risk of their being covered too deep, especially on the heavier class of soils.

The Effect of Manures upon Cooking Quality and Disease.—

(a) *Cooking Quality*: The quality of the potato is dependent upon many factors, including soil, season, variety, and the state of ripeness of the tuber, but manures also have an influence on this point. The application of a heavy dressing of dung appears

to depreciate somewhat seriously the value of a potato for cooking purposes. A moderate dressing is considerably less harmful, whilst the addition of a well-balanced mixture of artificials to a moderate dressing of dung will, other things being equal, produce potatoes of the first quality. Sulphate of ammonia is preferable to nitrate of soda when used along with dung, but when no dung is applied nitrate of soda, as an ingredient of a mixture of artificials, may be quite as satisfactory as sulphate of ammonia.

(b) Disease: Nothing very definite can be said on this point. Any manures, however, which tend unduly to stimulate the growth of the foliage, such as heavy applications of dung or mixtures of artificials containing a rather high percentage of nitrogen, appear to encourage the disease.

Time to Lift.—It is highly important that potatoes should be lifted as soon as they are ripe. It has been demonstrated repeatedly that comparatively healthy crops can be obtained from even those varieties which are generally regarded as being very liable to disease (*Phytophthora*) if attention is given to the above point.

Formation of the Pie.—The general principles on which a pie or clamp is made are practically the same throughout the country. The method of covering the pie, however, varies considerably, but the following, which is practised in some parts of Yorkshire, may be safely recommended. The usual roof-shaped pie is covered with a layer of straw about 6 in. thick. A plank about 1 ft. broad and from 8 to 10 ft. long is then placed along the top of the pie, and the sides to the length of the plank are covered with an inch or two of soil. The plank is then moved on and another length is covered with soil. In this way the top of the pie is kept free from soil, and provision made for ventilation. It may be necessary to add more soil to the sides later in the year, but the top is left untouched except, perhaps, in a time of severe frost, when a covering of potato haulm is put over the straw.

J. G. STEWART.

MANURING THE MANGOLD CROP.

In the latter half of April and during the early part of May the attention of farmers in many districts is mainly directed towards the cultivation and manuring of the land for the mangold crop. This crop under favourable conditions of soil and climate is one of the most valuable that a farmer can grow, and, perhaps, no crop can be so much influenced in yield by the character of the manuring.

As in the case of most crops so in this : the manuring may be conducted along three main lines. One may depend on farmyard manure alone, or on artificials alone, or on a combination of these two classes. The selection of the particular system of manuring will depend on the particular circumstances of the farm. If farmyard manure is abundant and of good quality, it may be most profitable to rely on it alone. On a farm where much straw is sold, or where the dung is chiefly used on the wheat or meadows, the mangold crop must be chiefly treated with artificials. But in the majority of cases the natural fertilizer is not so abundant, or of such high quality, as to be alone depended on, nor, on the other hand, is it so scarce as to be altogether ignored, the result being that plant-food is conveyed to the mangold crop by means of dung supplemented by various quantities and kinds of artificials. During the past fifteen years or so a very large number of manurial experiments, or field demonstrations, have been conducted on the manuring of this crop by agricultural colleges and societies, and from the results thus obtained it is possible to draw conclusions that one can apply with confidence to general or average conditions. It is, in fact, in this way that rules are framed for general guidance, and it is on such general rules that the bulk of the manuring is performed. But a study of the figures obtained from experiments and demonstrations shows conclusively that the acceptance of general principles will often lead to most unsatisfactory results, and no farmer can be sure that he is getting the most out of his land who has not determined its manurial requirements by means of some simple and well-conceived field experiments. The Board of Agriculture have prepared and issued some simple schemes that can be practised without much trouble and expense, and a copy of the

pamphlet that contains them is at the disposal of any farmer on application.

The Use of Farmyard Manure Alone.—If land is in good "heart," and especially if it is the custom to top-dress the straw crop that succeeds mangolds, it is often possible to grow nearly a full crop of the latter by using about 20 tons of dung without any addition. As a rule, however, it will pay better to use less dung for this crop, and to employ the surplus on some other crop of the farm, supplementing the dung by means of some artificial dressing.

The Use of Artificial Manure Alone.—Although very large crops of mangolds can be grown without any farmyard manure, this course would be justifiable only under very exceptional circumstances. The system might, however, be warranted on outlying fields, or in the case of a farm favourably situated for the sale of straw, but in any case the crop succeeding the mangolds (unless it were barley) would seldom give a satisfactory yield without the direct use on it of a considerable amount of artificials. Speaking generally, if artificials are alone depended on for the mangolds they should be ample in amount and should contain all of the three important substances: nitrogen, phosphates, and potash. Of these, most attention should be given to the nitrogen, the bulk of which should be derived from nitrate of soda. This manure, in the great majority of cases, acts much better than sulphate of ammonia on the crop under consideration. It is only in districts where the rainfall is heavy that the latter manure may largely replace the nitrate. Organic nitrogen, in the form of rape dust, blood meal, fish meal, dissolved bones, &c., often acts well in the absence of dung, and if these manures can be obtained at a reasonable price they may form a proportion of the mixture, and especially on the lighter classes of soil. Without dung nitrate of soda may be used up to 5 cwt. per acre, though 3 cwt. will usually suffice, or the half may be replaced by a corresponding outlay on one or other or several of the manures just mentioned.

In the majority of cases superphosphate will furnish the most suitable form of phosphoric acid, 5 or 6 cwt. per acre being as much as will usually prove profitable. Basic slag does not generally prove a satisfactory substitute for superphosphate for

use on this crop, at least when applied at the time of sowing the seed, though 3 or 4 cwt. per acre put on in early spring may, on light land, replace 2 or 3 cwt. of superphosphate. Dissolved bones, as has already been indicated, may to some extent be used, but bone meal is not to be recommended.

Potash has often proved to be the constituent that determines the success of this crop, and every farmer should take steps to ascertain how his mangolds react to its use. Of the three forms generally available—kainit, sulphate of potash, and muriate or chloride of potash—the preference is generally to be given to the first, 5 cwt. per acre being a normal dressing in the absence of dung. Much has been written about the effects of common salt on the mangold crop, but there can be no doubt that as a rule its use, at the rate of 3 to 5 cwt. per acre, will be found to pay, and especially on the lighter classes of land. Curiously enough it is found that if the ingredients of the artificial mixture are properly adjusted, 1 cwt. will, on the average, give about 1 ton of increase. Thus, a mixture containing say 3 cwt. nitrate of soda, 5 cwt. superphosphate, 5 cwt. kainit, and 3 cwt. salt, will often raise the produce of mangolds by about 16 tons per acre, as compared with unmanured land, that is to say about 30 tons per acre will be got as against about 15 tons on the unmanured area. Needless to say, however, the increase may be much more or much less.

The Use of Dung Supplemented by Artificial.—This is the usual and best combination in which to supply fertilizing materials to the mangold crop. What amount of dung should be used per acre must depend chiefly on the aggregate amount at the farmer's disposal. Speaking generally, and having regard to practical convenience, 12 tons per acre may be taken as the minimum, while little is to be gained by exceeding 17 tons. Of the supplementary artificials nitrate of soda is by far the most important, and 2 cwt. per acre may be put as the normal allowance. Phosphates are here of much less importance, and 2 to 3 cwt. per acre of superphosphate will usually suffice. Although dung holds much potash, the addition of this substance in the form of kainit can seldom with advantage be omitted, a fair allowance being 2 to 3 cwt. per acre, though more may often be advantageously employed. Here, as where artificials alone

are used, salt should be given at the rate of 2 or 3 cwt. per acre.

In some parts of the country it is the custom to top-dress the mangold crop when about a month old with 1 to 2 cwt. per acre of nitrate of soda, and, on the whole, the practice may be recommended. Where this course is followed some reduction may take place in the amount put on at the time of sowing the seed.

AGRICULTURAL EDUCATION IN CANADA.

The Board have received from the Colonial Office a copy of the following despatch, dated 23rd December, 1905, from Earl Grey, Governor-General of Canada, dealing with certain aspects of agricultural education in Canada :—

SIR,—I have the honour to report that I paid a visit last week to the city of Guelph, famous among agriculturists as the "Smithfield of Canada," because of the excellence of its annual fat stock show, and also owing to the fact that seven live stock associations hold in that city their annual meeting at the time of the fat stock show; and as the "Mecca of Ontario men and women" because of the practical training and preparation for the business of life given by the Ontario Agricultural College and by the Macdonald Institute. These are situated close to each other on high and picturesque ground just outside the city.

The annual meetings of the Ontario Experimental Union of the Ontario Agricultural College, and of the Women's Institutes, numbering fifty-eight, with a membership of over 5,000, are also held at Guelph during the week of the fat stock show.

I was most favourably impressed by the management of the provincial fat stock show. All the arrangements were designed for the purpose of focussing the attention of exhibitors and visiting farmers on the requirements of the consumer, and of teaching them what steps they should take in order to supply those requirements.

Two practices which were novel to me, but the value of which must be admitted by everyone when seen, are worthy of notice.

1. After the examination and selection of the stock exhibited, the judges are required to give their reasons for such selection. They explain to the large and interested body of assembled farmers, the points of excellence and superiority in the

animals to which prizes have been adjudged, and the weak or inferior points which caused the unsuccessful animals to be passed over.

This practice has a salutary influence upon the judges, the public are instructed, and the unsuccessful exhibitors are satisfied that their disappointment is the result of carefully-considered rules, and not due to caprice.

The judging of the live animals is followed by what is known as "the block test," *i.e.*, the judging of the carcasses of the animals exhibited.

The value of this practice has been proved by the fact that whereas when it was first adopted the prize live animal frequently did not win the prize given for the best carcass, this difference now occurs less frequently, thus showing that the judges have profited by the opportunity given them of learning to what points importance should be attached in judging live stock.

2. Lectures on the judging, breeding, feeding, and general management of live stock are given by members of the staff of the Ontario Agricultural College, and by carefully selected farmers, live stock dealers, exporters, and representatives from the large meat-packing and curing establishments.

I heard two lectures (*a*) on the champion steer, and (*b*) on the champion cow for dairy purposes. The prize animals were each brought in turn on to the stage of the theatre which had been erected for demonstration and lecture purposes. The tiers of seats were crowded from floor to ceiling by an interested assembly. The various points to be aimed at by the fatterer, of which the prize steer on the stage was a fine example, and the signs indicating quality, good constitution, and general excellence, were carefully explained. The lecturer's address was simple, clear, instructive, and useful. After the prize steer had been taken out, the prize cow was brought on to the stage, and a dairy expert, selected from the staff of the Ontario Agricultural College, explained the various points of excellence in the cow.

I have no hesitation in saying that I learned more about stock from these two short lectures than I have ever learned from my attendance at cattle shows in England.

The Ontario Agricultural College.—This college is maintained by the Government of the Province of Ontario, and I do not think I have ever been more favourably impressed with the methods of any educational system than I was with the practical character of the education given there. The whole system of education is based upon the assumption that the brain of the agriculturist is reached not by academic discourses in a town laboratory, where the student may be unfitted for the work of the farm, but through the eyes and fingertips, by the practical handling of animals and materials, and the visual demonstration of the right way in which acts of husbandry should be done.

Gratuitous instruction in judging live stock and seed grains is offered by the college to the farmers of the Dominion in short fortnightly courses. There are also short courses in poultry management and in dairying. The farmer is thus enabled to learn, at no expense to himself for tuition, the most scientific and up-to-date methods of managing a cow byre and a dairy, of selecting seeds and sires, of judging and fattening stock, and of keeping poultry.

The conservative farmer, who as a rule is prejudiced against the teaching of the academic theorist, is at once in sympathy with this form of instruction, which is based upon a demonstration of actual facts. There are, in addition, the regular courses for students in the college; two years leading to a diploma from the college, and two more years (four in all) leading to the degree of Bachelor of Science in Agriculture from Toronto University, the provincial university with which the Ontario Agricultural College is affiliated.

As an instance of the practical character of the education and illustrations given by the college, I might refer to an experiment I saw in course of operation in connection with poultry. There were four poultry-houses, all of varied construction, resulting in different temperatures inside during the winter. The result of this experiment has been to prove that the poultry kept in the house of cheapest construction, consisting of one thickness of wood only (1-in. boards), and with no artificial heat, produce most eggs and keep in the best condition.

The service rendered to the Dominion by the college in con-

nection with this experimental work has been of great value. A zealous and enthusiastic staff is engaged continually in comparing the results from the growing of different varieties of grain, and then in crossing the best varieties with each other, with the object of producing a heavier ear of grain and a larger yield per acre. There are 2,000 experimental plots on the farm under this department, and about 4,000 farmers in different parts of the Province are carrying on co-operative experiments in testing seeds, fertilizers, and methods of cultivation, as members of the Ontario Agricultural and Experimental Union, which has its headquarters at the Ontario Agricultural College. Seeds and fertilizers for the experiments are supplied free to any farmer that applies, and all he is required to do in return is to agree to conduct the experiment according to the directions, and to fill up a schedule stating the date of sowing, date of reaping, the amount of yield per acre, and other relative data. I was informed that one variety of barley which had been introduced by the college and distributed through the members of the Experimental Union had enabled farmers to obtain an increase of $4\frac{1}{2}$ bushels on the average of the ordinary crop. As there are over 500,000 acres under this particular kind of barley in the Province of Ontario alone, an increase of $4\frac{1}{2}$ bushels per acre means that this new variety introduced by the Ontario Agricultural College has added to the agricultural output of the Province over 2,000,000 bushels, which at 50 cents a bushel equals a million dollars a year. The college has now selected an improved strain of this variety and has crossed it with that of another variety. The experimentalist, Mr. C. A. Zavitz, informed me that he expected an even greater benefit to the crops of the Province from the result of this cross than was obtained from the introduction of the variety to which I have referred. Work of a similar character is also carried on at the Dominion Experimental Farms under Dr. William Saunders, C.M.G., Director.

In its early days the experimental work of the Agricultural College was derided by many of the farmers and by the public generally; now the sentiment of the Province is well on its side, and the agriculturists are becoming more and more proud of their college every year.

The Macdonald Institute.—Attached to the Agricultural Col-

lege is an institute founded by Sir William C. Macdonald at a cost of nearly \$200,000 for the training of young women in household science, for the training of teachers for Canadian schools in Nature study work in connection with school gardens, and for the preparation of teachers in manual training. They have garden plots and opportunities for practising teaching at the adjoining Consolidated Rural School, to which I will refer later. Their training is just as practical as that of the Ontario Agricultural College. They are given that instruction which will enable them to interest rural children in Nature. Sir William Macdonald's object is to make agriculture the most worthy and dignified, as it certainly is the oldest and most important, of all industries.

I may mention one plan adopted at the institute as an instance of the original and practical character of the education given. After the pupils have gone through their regular instruction in the long courses in the cookery classes, each one in turn is put in sole charge for one whole week of the kitchen attached to the suite of rooms occupied by the lady principal. The student is introduced to a kitchen empty of everything but its bright and beautifully clean utensils. She is expected to buy everything herself from the town shops, and cook everything herself without assistance, for the lady principal and two friends. She is also expected to pay the bills herself out of money provided by the college, and to leave the kitchen at the end of her week as bare and clean as she found it on entering. I was informed that the practical results of this teaching were of the highest value, each of the pupils straining every nerve to provide the lady principal with a good table at the lowest cost possible.

Consolidated Rural School.—In the grounds of the college there is also a Consolidated Rural School, built by Sir William Macdonald. This Consolidated School serves the requirements of five elementary school areas within a radius of five or six miles. Hitherto at each of these small schools a single teacher had to stretch his or her unaided fingers over a human octave running from five to thirteen years of age and more.

Sir William Macdonald, realising that much improvement and advancement might be made in education for rural communities, has provided at his own expense (in each of four Provinces), as

an experiment, one Central Consolidated School, which has taken the place of several small schools. At this Consolidated School thoroughly trained and well paid teachers concentrate their tuition upon children about the same age and degree of mental advancement, and the character of the education is as good as any that can be obtained in a town school. Further, the usual course of study at other schools has been enriched and improved by the addition of Nature study with a school garden, and by lessons in cooking and sewing and manual training in cardboard and woodwork. Each child at the Consolidated School has his or her own garden plot. Gardening enters into the curriculum as a most important subject, and illustration plots show the children and the parents the results (1) from the selection of good seed ; (2) from a proper rotation of crops ; and (3) from protecting crops by scientific methods, such as spraying the potato crop with the proper mixture with the object of destroying destructive insects, and of combating disease. Covered vans bring the children from the outlying districts to the school in the morning and take them back in the afternoon.

Sir William Macdonald's experiments in connection with the substitution of one Central Consolidated School for several small rural schools would appear to establish the three following conclusions :—

1. The character of the education given at Consolidated Schools is greatly superior to that formerly given at the five or six small schools superseded.

2. The cost of education at the Central Consolidated School, caused by the expense of van transportation, is greater than that of the small schools.

3. The value to the community of this improved education cannot yet be ascertained, but it will doubtless be greater than the increased cost.

I have, &c.,
(Signed) GREY.

To the Right Hon. the Secretary of State for the Colonies,
&c., &c.

Among the various measures passed some years ago by the Prussian Government with a view to the amelioration of agricultural conditions were two laws (June 27th, 1890, and July 7th, 1891) contemplating the provision of small holdings, the purchase of which was to be effected by regular payments in the form of rent for a fixed period of years.

**Formation
of Small Holdings
in Germany.**

The legislation in question provided for the formation of General Committees in different Provinces, which should undertake negotiations for the purchase and sale of holdings, prepare plans, afford legal and technical assistance to the purchaser and in every way facilitate the transfer. The transaction was to be concluded through certain Government institutions known as *Rentenbanken*, which effected the purchase either by a cash payment or by giving the seller a negotiable bond, guaranteed by the State, for three-fourths of the price agreed upon, and received from the new holder an annual rent based on a scale providing for the extinction of the mortgage with interest on the capital. Six of these Committees have been formed at Breslau, Bromberg, Frankfurt a.d. Oder, Hanover, Königsberg and Münster.

The Committees do not administer any State funds, but merely arrange for the transfer of holdings, the liability of the State being confined to the guarantee for the payment of the purchase price, the repayment of which is covered by the annual rent.

The experiment, which has now been in operation for some years, appears, from an article in the *Landwirtschaftliche Jahrbücher* (1905, Part I.) by Herr Linschmann, to have met with considerable success. Between 1891 and 1903, no less than 9,923 holdings have been allotted, having an area of 280,000 acres, and valued at £4,233,000. The average price was about £15 per acre. Some 317 holders had become bankrupt, and involved the State in a loss of £34,000, but this sum is considered very small in view of the total amount involved, and it is thought that with increasing experience losses of this kind will be avoided.

In the article mentioned above, Herr Linschmann gives some

concrete instances of the successful conversion of large farms into a number of smaller holdings. One farm (Plümenhagen) of about 700 acres, for example, together with eight small holdings covering 175 acres, was cut up into thirty holdings, one of which was over 62 acres, eleven varied from 25 to 62 acres, thirteen from $12\frac{1}{2}$ to 25 acres, while five were less than $12\frac{1}{2}$ acres. The rent of the farm, before being divided, was £650 per annum, while the aggregate payments of the thirty holders only amount to £719, which includes a payment of 3 per cent. on the capital value, and is payable for a period of sixty and a-half years, when the debt will be extinguished. The number of persons in the area has increased from 95 to 130.

The cost for buildings amounts to about £270 for a one-horse farm, and £390 for a two-horse farm.

Since the division of the estate, the number of live stock and the production of crops are stated to have considerably increased; the live stock compares as follows:—

—						As one farm.	In small holdings.
Cattle ...	...	...	...	...	...	48	131
Horses	...	...	...	...	...	20	43
Pigs ...	...	...	...	...	...	40	356
Poultry	...	...	...	...	...	53	608

The production of hay, roots, potatoes, and cereals, as well as of butter and eggs, was much larger, so that whereas the average annual revenue from the total sales for the preceding five years had been about £1,250, it averaged in the two years after the subdivision about £3,500. It may be pointed out, however, that the previous management of the farm had not been very successful, the tenant being unable to pay his way, and for very many years it had, for no apparent reason, failed to give good results, having changed hands no less than fourteen times in seventy-eight years.

An example is also given of another estate (Zemitz) of some 1,370 acres, which, on account of the nature of the soil, distribution of the fields, and means of communication, had not proved satisfactory when managed as a single farm. It was considered, however, to present many advantages for cultivation in smaller lots, the division of the land allowing of a proportion of arable and pasture land to be allotted to each holding, the light but

productive soil was easy of cultivation, while the large proportion of pasture enabled a good stock of cattle to be kept. It was split up into fifty-one holdings, of which thirteen were under $6\frac{1}{4}$ acres, fifteen under 25 acres, twenty from 25 to 62 acres, and three above that area. The majority (32), however, were classed as one-horse farms of an average size of about 32 acres, bearing a rent of about 14s. per acre.

Here, also, a very great increase in the number of live stock is reported; in September, 1903, there were 70 horses, 212 cattle, 340 pigs, and 771 head of poultry on the estate, whereas before the subdivision there were only 27 horses, 88 cattle, 120 pigs, and practically no poultry. The number of persons, moreover, living on the land was 300 compared with 70 when held as one holding, or more than four times as many as before.

It will be seen that the holdings were not generally very small in size. The laws relating to the "Rentengüter" did not, in fact, contemplate the provision of holdings for agricultural labourers, as it was thought that very small holdings did not on the one hand afford sufficient security for the payment of the rent nor secure the independent existence of the occupier. However, an experiment was made at Zemitz in what are called "labourers' holdings" of a size which would enable the occupier to keep a cow and some pigs and geese sufficient to give him a certain independence, but without releasing him from the necessity of obtaining employment in the neighbourhood. The area chosen for this purpose was 5 acres, of which $2\frac{1}{2}$ acres were pasture, and the remainder arable and garden land. The thirteen holdings, which were thus arranged, were quickly sold, and the experiment appears to have been successful. The holders are employed on the larger holdings in the neighbourhood, being only entirely occupied on their own land at times of tillage and harvesting.

As was stated above, the work of the General Committees, established by law to encourage the formation of small holdings, is chiefly of an advisory character, and although three-fourths of the purchase money is guaranteed by the State, the task of converting a large estate into a number of small holdings is one which not only requires considerable skill, but also the outlay of substantial sums of money. To meet this difficulty to some extent a law was passed (the so-called *Zwischenkreditgesetz* of 12th July, 1900) providing for temporary advances to prevent

the accumulation of debts on properties and for the erection of buildings. Up to the end of 1904, £463,000 had been assigned for this purpose. Certain private associations have also been formed to purchase properties from owners, and to undertake the settlement and division with the help of the General Committees. One of these, the Berlin Land Bank, though it does not confine its business to small holdings, has established a considerable number on the properties passing through its hands. For instance, one estate, of some 8,400 acres, included after subdivision six good-sized farms, eleven holdings above 62 acres, thirty-five from 25 to 62 acres, forty-seven from $12\frac{1}{2}$ to 25 acres, twenty-six from $6\frac{1}{4}$ to $12\frac{1}{2}$ acres, and thirty-three below $6\frac{1}{4}$ acres. After the redistribution, the population had increased from 915 to 1,456 persons, and the number of horses, cattle, and pigs had doubled. In the case of another estate, to which reference is made, the population is stated to have increased from 232 to 600 persons, and in this case the live stock before the settlement numbered 76 horses, 174 cattle, 178 pigs, and 406 head of poultry, figures which were increased after the holdings had been allotted to 121 horses, 480 cattle, 960 pigs, and 1,500 head of poultry.

Numerous experiments have been carried out in Germany for the purpose of testing the effect of the new chemical manure,

**Experiments with
Lime Nitrogen.**

(*Calcium
Cyanamide.*)

“lime nitrogen”* (*Kalkstickstoff*), which is the product of nitrogen and calcium carbide. The nitrogen is obtained from the atmosphere by passing air through vertical retorts or cylinders containing copper shavings, and heated to a temperature of about 400 deg. C.; in passing through these retorts the oxygen of the air is taken up by the copper, the nitrogen is then conveyed in pipes to a retort heated by an electric furnace and filled with calcium carbide. The nitrogen is absorbed by the carbide and forms calcium cyanamide. This substance is being manufactured by the *Cyanid Gesellschaft* of Berlin, and supplies can probably be obtained for experimental purposes. The German Agricultural Society have made arrangements for the supply of limited

* *Journal*, March, 1904, p. 506, and May, 1905, p. 101.

quantities to their members at about £11 per ton. It contains 19 per cent. of nitrogen.

Experiments for the purpose of testing its effect both on the germination of seed and as a manure were carried out by Dr. Haselhoff at the Agricultural Experiment Station at Marburg* in 1903 and 1904, both by means of pot and field experiments.

The experiments as to its effect on germination were concluded in 1903, and showed, generally, that the direct action of lime nitrogen was injurious, but that the injury was dependent on the length of time the nitrogen was given to the soil before the seed was sown. Thus if soil which had received one-half per cent. of lime nitrogen was employed, and sowing took place a week after the manuring, the final result of the germinating test was unaffected, both in the case of clover and mustard. If sand alone was used, the germinating power of clover was somewhat diminished, even when the manure was applied a fortnight before; and if the seed was sown in less than a fortnight, germination did not take place. When mustard seed was used, germination was prevented even after an interval of three weeks, and injuriously affected after a month. Similar results, in a greater or less degree, occurred if the proportion of lime nitrogen was increased or diminished.

In the pot experiments, undertaken to test its manurial value, a light, loamy sand, containing in dry matter '060 per cent. total nitrogen, '220 per cent. lime, '194 per cent. magnesia, '100 per cent. potash, and '089 per cent. phosphoric acid, received a suitable dressing of phosphates, potash, and lime, while nitrogen was supplied partly by nitrate of soda and partly by lime nitrogen. The nitrate of soda was applied as a top-dressing, while the lime nitrogen was mixed with the soil. Mustard was sown a fortnight later, but failed to come up in the lime nitrogen pots; the soil was therefore turned over and seed again sown four weeks after the application of the lime nitrogen, but without result. The operation was repeated at an interval of six and a-half weeks, when only three seeds out of a considerable number germinated. In each of the above instances the amount of lime nitrogen applied was equivalent to the amount of nitrate of soda known to give satisfactory results.

* *Landw. Jahrbücher*, Vol. 34. *Deutsche Landw. Presse*, 17th March, 1906.

When half this quantity was applied, the seed germinated when sown one month after the application of the manure, but the growth was less satisfactory than that in the nitrate of soda pots. When the quantity was reduced to one-fourth and one-eighth, the germination seemed unaffected, and the fertilizer produced a good yield, equal to 95 per cent. of the average crop from the nitrate of soda. In 1904 buckwheat was sown, and grew satisfactorily, except when the full quantity of lime nitrogen was used, when the development at first was somewhat backward, though it recovered later.

Looking at the results obtained in the pot experiments in the two years, it is considered that if the effect of the nitrogen in nitrate of soda be expressed as 100, the action of lime nitrogen is equal to 79. It is also evident that lime nitrogen acted favourably on plant growth when a sufficiently long period elapsed between its application and the sowing of the seed.

The field experiments were carried out in one case on a light loam with rye and potatoes, and in another case on a heavy loam with barley, potatoes, and mangels. In both instances a uniform manuring with lime, kainit, and basic slag was given. Each plot was 120 square yards in area. In the rye experiments on light loam the lime nitrogen was applied on the 17th September, 1903, and the nitrate of soda one-third shortly before the sowing, one-third on 30th March, 1904, and one-third on 18th April as a top-dressing. Shortly after the first dressing and before seeding a heavy rain fell. Seed (rye) was put in on 22nd September, 1903, that is, only five days after the application of the lime nitrogen, but no injurious effects showed themselves. The results were as follows:—

Manures.	Yield per acre.		Per cent.	
	Grain.	Straw.	Grain.	Straw.
	Cwt. qr.	Cwt. qr.		
Unmanured	10 3	30 1	100	100
Nitrate of soda (three applications)	17 0	41 2	157.4	136.9
Lime nitrogen	14 0½	40 2	131.5	133.6
Nitrate of soda (two applications in spring)	17 2	39 3	159.3	131.6
Lime nitrogen	14 1½	38 1	133.3	126.3

It will be seen that the lime nitrogen gave a substantial increase in the crop, notwithstanding seed being put in immediately after the manure, though the results were not equal to those from nitrate of soda.

In the potato experiments lime nitrogen was applied on 25th April at the rate of 109 lb. per acre, while nitrate of soda at the rate of 127 lb. per acre was put on as a top-dressing, half on 5th May and half on the 10th June. The potatoes were planted on 30th April. No special difference in the growth on the plots was apparent to the eye and no disease appeared. The results were as follows :—

Manures					Yield per acre.	Per cent.
					Cwt. gr.	
Unmanured	...	...	...	...	126 0	100
Nitrate of soda	...	...	...	...	138 1	109·8
Lime nitrogen	...	...	...	...	138 3	110·1

In this case the lime nitrogen proved equal to nitrate of soda.

The experiments on heavy loam were carried out with barley, potatoes, and mangels. The manuring was varied on different plots, the lime nitrogen being applied a fortnight before sowing, and also as a top-dressing, as was also the nitrate of soda. Taking the results of the several plots together the yield of barley may be expressed thus :—

—					Grain.	Straw.	Total crop.
Unmanured	...	...	...	...	86·3	79·8	78·4
Nitrate of soda	...	...	...	...	100	100	100
Lime nitrogen	...	...	...	...	100·6	90·8	93·7

From these figures it would seem that the lime nitrogen interfered with the yield of straw, although in regard to production of grain it was equal in its effect to nitrate of soda.

The experiments with potatoes gave very satisfactory results, the effect of the lime nitrogen being calculated as 93·6 per cent. that of nitrate of soda, and the results with mangels were very similar, working out to 94·6 per cent.

In general, all the trials with barley, potatoes, and mangels were favourable to the action of lime nitrogen. From the whole of the experiments Dr. Haselhoff concludes that lime nitrogen affects the germination of the seed, but so soon as the injurious properties are dissolved by the soil the nitrogen it contains is available as plant food, and its action approximates to that of nitrate of soda. The period required to dissipate the injurious combinations in lime nitrogen varies according to the character of the soil, and for the present caution is recommended in regard to its employment in actual practice.

Experiments of a somewhat similar character have been undertaken at the Experiment Station at Augustenberg by Professor Behrens,* where for the purpose of testing the effect of lime nitrogen on germination seven plots were employed. They all received farmyard manure in the winter, and then on the 26th March lime nitrogen was applied and lightly harrowed in on all except one (Plot I.). Barley was then immediately sown on Plots I. and II., one week later on Plot III., two weeks later on Plot IV., three weeks later on Plot V., four weeks later on Plot VI., and five weeks later on Plot VII. Germination occurred normally on all of them except on Plot II., where the seed was sown immediately after the distribution of the lime nitrogen. On this plot only a small number of grains germinated, almost exclusively on the edges of the plot, and these were about ten days later than the grain on Plot I. From this it would seem that an interval of a week between the application of the lime nitrogen and the sowing of the seed was sufficient to prevent any injurious effect, and this is in agreement with the field experiments at Marburg.

Two series of experiments are reported from the Experiment Station of the Agricultural Chamber of the Duchy of Oldenburg.† In the case of roots sown ten days after the application of the lime nitrogen no injurious effect on the germination and growth of the plant was observed. The yield obtained was about equal to that from nitrate of soda.

Lime nitrogen applied to grass land seems to have produced relatively little effect. This may have been due to something

* *Deutsche Landw. Presse*, 18th November, 1905

† *Deutsche Landw. Presse*, 16th December, 1905.

in the condition of the soil which was unfavourable to the use of nitrogen in this form, or as it was simply sown broadcast part of the nitrogen may have passed into the atmosphere and been lost.

Another series of pot experiments to test the action of this substance on germination are reported* by Professor Schulze, of Breslau. Here seeds of mustard, rye, wheat, oats, and barley were sown at the same time as the application of lime nitrogen, and one, two, three and four weeks afterwards. Seeds were also sown in unmanured pots for comparison and the germination recorded daily. These experiments showed that the percentage of germination, and in part the germinating energy also, were reduced when the sowing and the manuring took place simultaneously. A reduction in germinating power was also noticeable in the case of mustard, rye, and oats when an interval of a week was allowed, but after fourteen days injurious action seemed to have ceased.

In 1905 the experiments were repeated on a more comprehensive scale. In the case of oats, rape, buckwheat, and potatoes, the germination in the pots treated with lime nitrogen when compared with the unmanured pots seems to have been unaffected. In the case of wheat, barley and sugar beet, the germinating energy only seemed to be affected, that is, the seeds took longer to sprout, while in the case of rye, flax, carrot, and spurrey the percentage of germination was less, in addition to a decline in germinating energy. It is to be noted that the injurious effect was found to be greater and more lasting on light sandy soil than on better and richer soil. Generally, Dr. Schulze recommends, in order to avoid all danger, that this manure should be applied from a week to a fortnight before the seed is sown, and this is the conclusion which may be drawn from the experiments generally. The effect of the new fertilizer appears to be about 93 to 94 per cent. that of nitrate of soda.

* *Fühlings Landw. Zeitung*, 15th December, 1905.

**Experiments
with
Sugar-Beet.**

In 1898 experiments in the growth of sugar-beet were carried out on a somewhat large scale in Great Britain by a committee of the Central Chamber of Agriculture, and the results were reported in this *Journal* (Vol. VI., June, 1899, p. 45). In view of the interest which has been attracted to the question it may be useful to recall that on the average of the forty-seven cases of which detailed particulars were available the mean yield of sugar-beet was 24·2 tons with leaf, and 16·3 tons without leaf; the average quantity of sugar in 100 parts of the juice, as reported by the analysts who examined the samples, worked out to 15·65; the average quotient of purity was 85·19; and the average quantity of sugar in 100 parts of the roots was 14·48. The view taken at that time was that in certain districts, and in seasons when the climatic and other conditions were especially favourable for its growth, sugar-beet might be cultivated with advantage, provided the prices which could be obtained for the produce were satisfactory.

Recently the question of sugar-beet growing has been again discussed, and the Essex Education Committee have conducted experiments to find the yield and quality of the beet grown on typical soils and to compare some varieties. The results show that beets have been grown equal to those produced in sugar-making countries, but, as the report points out, "it does not follow that even when this has been established beyond any possibility of doubt that the undertaking is one which would necessarily be a commercial success. The business side of the question—the cost of production, the cost, under the local conditions prevailing in the Eastern Counties, of working a factory, and a host of similar points need careful and experienced consideration."

Experiments were undertaken at five centres, on plots one-tenth of an acre in extent, which received in addition to a dressing of farmyard manure 3 cwt. per acre superphosphate and 2 cwt. per acre nitrate of soda. As it is held by some workers that the sugar content is considerably increased by the use of sulphate of potash, half the plots received in addition a cross-dressing of sulphate of potash at the rate of 2 cwt. per acre.

The plots were situated in every case in fields which had

been prepared for mangel, and no special preparation was made for the sugar-beet, the whole field being subject to the same tillage operations.

Sugar-beets have been encouraged by many years' selection to grow tap-rooted and to bury themselves deeply in the ground, and it became evident as the season advanced that many of the beets were showing a tendency to fork, and that deeper cultivation was necessary if shapely roots were to be obtained. In sugar-beet growing countries every effort is made to secure a deep and mellow tilth for the seed-bed, and in Essex good shaped beets were obtained where special cultural methods were followed.

A point which would become of importance to farmers growing the crop on a large scale is the difficulty of lifting it. This was variously estimated at the different centres at from £2 2s. to £5 per acre, but in actual practice the cost of lifting would probably not exceed £2 10s. per acre.

The cost of growing at the five Essex centres, exclusive of rent and taxes, but including chemical manures, was returned as follows :—

						£	s.	d.
Chelmsford	...	...	...	...	...	10	18	0
St. Osyth	...	...	...	...	...	10	3	2
Great Yeldham	...	...	...	...	...	11	3	1
Maplestead	...	...	...	...	...	9	3	0
Great Stambridge	...	...	...	...	...	11	17	6
Average	...	...	...	...	...	£10	12	11½

The cost per acre would probably be less if the crop was grown on a large scale instead of on several small experimental plots, but there seems to be a general agreement that an acre of sugar-beet yielding 18 to 20 tons cannot be grown under £10, and any calculation based on their production in Essex at a lower figure would be risky. It is impossible, of course, to say the exact price the English farmer could expect to get for his roots, but it would probably be from 17s. to 20s. per ton of trimmed roots delivered at the factory.

In considering the results of the experiments it should be remembered that the value of the beet depends on two things, (1) percentage of sugar in roots, (2) purity of the juice. The purity of the juice largely determines the price which the sugar manufacturer will be able to give for the roots, and it represents to him a measure of the cost of obtaining the sugar in a crystalline form.

Purity of juice is the per cent. of sugar in the dry matter of the juice; thus if a sample is found to give on analysis 20 per cent. of total solids and 16 per cent. sugar in the juice, then four-fifths or 80 per cent. of the total dry matter in the juice is sugar and the purity co-efficient is 80.

It has been found, as the result of much investigation on the Continent and in the United States, that small roots contain the highest percentage of sugar, and are best adapted for manipulation in the factory. This is confirmed by experience in Essex. It is in the best interest of both producer and manufacturer to grow average crops of small beet with a high percentage of sugar and a pure juice.

The beet was planted closer together than ordinary mangel. At Maplestead, for example, they were grown on the flat in rows 11 in. apart and set out at about 8 in., and a good crop of small roots was obtained, containing the highest percentage of sugar. This is, however, too close for the production of properly matured roots on this class of land, and rows 18 or 20 in. apart will probably be found to answer best.

The following table gives the average yield per acre, per cent. sugar in the beet, and purity of the juice (excluding red top variety):—

Centre.	Yield per acre, tons.	Per cent. Sugar in Beet.	Purity co-efficient of Juice.
Maplestead	14·5	17·4	85·0
Chelmsford	20·5	17·3	85·0
Yeldham	20·7	17·1	84·3
St. Osyth	10·9	16·2	85·7
Great Stambridge ...	25·0	15·5	83·5
Average for all Centres	18·3	16·7	84·7

At each place a variety known as red top sugar-beet was grown. In its habits this variety is altogether unlike the others and closely resembles samples of sugar-mangel. The average yield of this variety is 24·5 tons per acre, showing on analysis 11·8 per cent. sugar and 79·2 purity.

The Klein Wanzleben varieties gave slightly the highest percentage of sugar and a good juice in every case.

In connection with the above experiments, some observations by Dr. Voelcker in his report to the Royal Agricultural Society

are of interest. He states that the season of 1905 was particularly favourable to the growth of roots of a character such as a factory would desire, viz., a root well matured and not of large size. Hence one would expect the roots in such a season as 1905 to be rich in sugar, and this proved to be the case, as the subjoined analyses show. In comparison with these results are given some obtained in 1904, exemplifying the differences which season will make :—

---				Water.	Sugar.	Crude Fibre.	Albuminoids, Ash, &c.
1904.							
Sample No. 1	...	...	...	87.07	7.92	2.16	2.85
" No. 2	...	...	...	88.09	6.99	2.06	2.86
" No. 3	...	...	...	86.85	6.80	2.30	4.05
" No. 4	...	...	...	87.92	6.60	1.80	3.68
1905.							
" No. 5	...	...	...	—	15.46	4.94	—
" No. 6	...	...	...	—	13.23	4.19	—
" No. 7	...	...	...	—	15.21	3.92	—
" No. 8	...	...	...	76.63	14.99	5.26	3.12
" No. 9 (Mangel-beet)	..			84.92	8.22	2.98	3.88

The samples examined in 1904 were grown near Norwich; No. 5 (1905) was from a 14-ton-per-acre crop grown near Ipswich, the seed being of the Wanzleben variety, and manured with farmyard manure only; No. 8 was grown in Bucks, and No. 9 was a sample of "mangel-beet" from the same farm. It will be seen how much higher was the sugar percentage in the roots of 1905 than in those of 1904. But Dr. Voelcker observes: "There can no longer be any doubt of the possibility of growing in this country in a favourable season beet containing a good percentage of sugar, but it is equally certain that there are many other factors that have to be taken into consideration before it can be concluded that the production of beet sugar in this country will be a commercial success."

The importance of ascertaining the quality of potatoes by actual cooking tests is becoming more recognised. In the extensive series of experiments carried out at Leeds University, trials of this description were included; and this was also the case in the potato experiments conducted during the past year

Cooking Quality of Potatoes.

by the Edinburgh and East of Scotland Agricultural College. In this latter case samples were taken to the College laboratory and cooked by a combination of boiling and steaming. All the varieties received exactly the same treatment, and those from each centre were dealt with at the same time. After being cooked, with numbers attached, they were set out on a table and judged by several persons acting independently. Marks were awarded as follows :—

<i>Appearance</i> —Dry, white, mealy, and glistening	... .. 10
<i>Texture</i> —Firm, and free from soapiness in the centre	... 10
<i>Flavour</i> —Taste pleasant, and free from peculiar flavours	... 10

The results of this test varied somewhat. The potatoes from some of the centres were found to be of better quality than those from others, and the order of merit was not always exactly the same. For instance, Factor and Pink Blossom were superior to Up-to-Date at some of the centres, but at others no superiority could be detected ; and it even happened in one or two cases that Up-to-Date was placed a mark or two above either of these two varieties. But, excepting slight variations such as these, the relative position was approximately the same at each centre, and no difficulty has been experienced in grouping the varieties in the following order of merit :—

Excellent—Langworthy.

Very good—Twentieth Century, White Blossom, British Queen.

Good—Pink Blossom, Factor, Up-to-Date, King Edward VII.

Fair—Goodfellow.

Inferior—Evergood, Empire Kidney, Empress Queen, Royal Kidney.

The varieties classed as *inferior* need little consideration. They were far from being satisfactory in appearance, all were wet and soapy in the heart, none were good, and some were decidedly bad as regards flavour. Moreover, although they are all new varieties that have been boomed a good deal, none of them have turned out good croppers excepting Evergood, which has given very variable results—the yield being extremely high at some centres and very low at others.

Goodfellow is the only variety classed *fair*. This is a round potato that presents a uniform attractive sample. It is a good

cropper, but the quality is disappointing. It would probably reach a passable standard on some farms, and fall short of this on many others.

The varieties in the group classed *good* are at least equal to Up-to-Date in quality, and some of them surpass it. Quality in potatoes, of course, will vary considerably with soil and cultivation. On some farms the varieties classed here as good would be very good indeed, while on others they would be no more than tolerable. Their defect is a slight tendency to softness in the heart. The three heaviest cropping varieties fall into this group.

All the varieties styled *very good* were very satisfactory as regards quality; but when broken they fall short of the firm, flaky texture which is characteristic of the Langworthy, and which, along with fine flavour, entitles this variety to be ranked as excellent.

Comparing these results with those obtained at Leeds,* it may be noted that the order of merit in which some of these varieties were arranged in two tests in 1904 and 1903 was British Queen, Empress Queen, Up-to-Date, King Edward VII., Royal Kidney, Goodfellow, and Evergood.

Some account of the experiments carried out in France with a species of tuber of the potato family has already been given in this *Journal* (Vol. XI., p. 412, Oct., 1904).

A New Tuber. This tuber, originally obtained from Uruguay, was cultivated experimentally by M. Labergerie, and produced in 1901 several distinct varieties, one of which, the violet type, attracted much attention, and gave promise of proving a useful edible variety, yielding heavily and being entirely resistant to disease. The cultivation of the different varieties has been continued under very careful supervision, and it may be noted that the varieties, as well as the original type, appear

* *Journal*, April, 1905, p. 33.

very susceptible to cultivation and rapidly improve when grown in fertile soils. The violet variety now resembles externally the ordinary European potato, but the yield appears to be from 30 per cent. to 100 per cent. greater on moist or wet land.

An attempt has been made to identify this variety with the *Géante bleu* potato, but M. Labergerie points out* that, apart from its larger yield and resistance to disease, the *Solanum commersoni* (violet) commonly produces tubers above ground, its fruit differs in shape, and that it has in numerous instances reverted to the primitive type. Besides the violet type, there are now some thirty other varieties produced from the wild plant, but these are, however, not at present fixed. Some of them seem to have a marked predilection for moist soils, others for dry soils, and some are remarkably rich in starch.

It is considered that the remarkable adaptation of the *Solanum commersoni* (violet) to wet soils and its large yields make it suitable for cultivation on marsh lands, &c., hitherto uncultivated.

India.—According to the second General Memorandum, dated March 7th, on the wheat crop for 1905-6, the total area under wheat in British India is estimated at

Notes as to 21,675,500 acres, and at 23,074,000 acres
Crop Prospects. for all reported areas in India. In the

United Provinces the area is computed to be 15 per cent. short of the normal, while there is an expansion of some 2.6 per cent. in British India (excluding the United Provinces) and a net contraction in the Native States of 16.4 per cent. The recent rains have greatly improved the prospects in most quarters, and the condition of the crop is reported to be good on the whole.

Australasia.—The official estimates of the Australasian Colonies are given in *Beerbohms' Corn Trade List* as follows:—

* *Journal d'Agric. pratique*, 8th March, 1906.

	(In Thousands of Bushels.)		
	1905-6.	1904-5.	1903-4.
Victoria	23,500	20,945	28,536
New South Wales	20,640	16,465	27,334
Queensland	1,700	2,150	2,437
South Australia	21,000	13,023	13,209
West Australia	1,500	1,692	1,876
Tasmania	700	790	767
Total	69,040	55,065	74,150
New Zealand	6,500	7,300	7,890

Argentina.—According to the same publication the official crop returns put the wheat crop of Argentina for the year 1906 at 3,882,000 tons (of 2,204 lb.), which may be compared with 4,102,000 tons in 1905, and 3,529,000 tons in 1904.

Some plants of lucerne were recently sent from a farm near Herne Bay to the South-Eastern Agricultural College, Wye, and on examination by Mr. Salmon were

A Fungous Disease of Lucerne.

found to be attacked by a fungus, *Urothlyctis alfalfæ*, which had not previously been reported as occurring in England. Mr. Salmon, in communicating this fact to the *Gardeners' Chronicle* (24th Feb., 1906), states that on examining the plants several superficial, warted, gall-like outgrowths, about three-quarters of an inch across, were found on the crown of the root. These "galls" consist of the hypertrophied tissue of the host-plant, and were found on being cut across to contain a number of minute cavities or chambers filled with a crowded mass of brownish spores, which are the resting-spores of the fungus. From the appearance of the plants it was evident that they had been infested for some time, and the injuries caused had induced the plants to throw out fresh or extended crowns. Some of the plants were almost killed.

The present disease was first observed in 1892 in Ecuador, where it causes considerable loss in certain districts. It is not

improbable that it occurs in other countries of South America. The fungus was observed to be most destructive to plants sown on damp ground, and in such spots many old fully-grown lucerne plants were killed. In these cases "galls" much warted or coralloid externally, and often reaching the size of a tolerably large apple, had been formed in considerable numbers on the crown of the root. These "galls" closely resembled externally those found on the roots of alder.

In 1902 the disease was reported from Colmar, in Alsace, Germany, where it occurred destructively on cultivated lucerne. It is now reported as being not uncommon in Alsace, and in certain localities in Switzerland, and it has quite lately been observed in Italy.

In connection with the cases of poisoning by "Java" beans which were reported in the previous issue of this *Journal*,

**Poisoning of
Cattle by
"Java" Beans.**

Professor McCall, of Glasgow Veterinary College, carried out some experiments with samples of the bean meal used in one case. The material was given to a collie dog, a Shorthorn cow, and a black and white cob, with the result that they all died, the dog within two hours and the cow and horse within one hour of the first appearance of the symptoms.

A noticeable feature in the experiments was the period of time which elapsed, namely, fifteen or twenty minutes, between the ingestion of the Java meal and the appearance of toxic symptoms. The explanation is that the poison does not exist in the form of free hydrocyanic acid in the beans; but the elements are there, and on the addition of moisture and heat (both of which are furnished by the stomach) a chemical combination occurs resulting in the slow and gradual production and liberation of the deadly poison.

When these conditions are produced artificially outside the body the formation of the poison goes on gradually for several days.

It is frequently stated that when the Java meal is boiled the volatile poison is driven off and that the meal can then be used with impunity. In the experiment with the cob, however, the

meal was boiled in water for one hour, and the result showed that boiling cannot be regarded as a safeguard.

A quantitative analysis of the Java meal revealed the fact that in each pound of meal there were nine maximum doses of prussic acid for an adult.

In a paper on the poisonous properties of these beans submitted to the French Academy of Science by M. Guignard,* it is mentioned that in March, 1905, a consignment of "*Fèves de Kratok*" arrived at Rotterdam which was composed of one or more varieties of *Phaseolus lunatus*, and that four persons were poisoned by these beans. In November and December last, beans of the same description, sold as "Java" beans, were the cause of numerous losses among horses, cattle, and pigs in Hanover. More recently still some dozen cases of poisoning have been reported from Belgium among animals fed on the beans or on the bean meal, which in the majority of instances had been cooked. Beans of this character have also been offered for sale in France at Paris, Lyons, and Marseilles.

Two prosecutions have recently been undertaken by the Herefordshire County Council under the provisions of the Fertilizers and Feeding Stuffs Act, 1893.

Adulteration of Feeding Stuffs. In one instance a substance described on the invoice and on the label as "best pea-meal" was analyzed and found to be largely adulterated with fine sharps or with a similar finely ground offal from wheat. There was a deficiency in albuminous compounds, which are an important element in pea-meal, and it was considered that not more than one-half the sample was pure pea-meal. A fine of £15, including costs, was imposed.

The second instance dealt with the sale of a substance invoiced as "white maize meal," which on analysis proved to consist of only two-thirds genuine maize, the remainder being rice husks which were worthless for feeding purposes. It was deficient in albuminoids, and contained a great excess of indigestible woody fibre. A feature of the defence in this case was that the description on the invoice was a clerical error, and that the meal

* *Comptes Rendus*, 5th March, 1906.

was not sold as "maize meal" but as a patent American meal. The "sale note" was produced in support, with the result that the case as regards the invoice was dismissed, but a fine of £10, including costs, was imposed for selling the meal without disclosing the fact that it contained an ingredient worthless for feeding purposes.

In connection with the arrangements made in a number of counties in Great Britain for testing milk for farmers, dairymen, and cowkeepers (see Leaflet 146), the Shepton Mallet Grammar School have now, at the suggestion of the Board, agreed to carry out tests on similar lines for farmers in Somerset at the rate of 6d. per sample. These tests will be made by the Gerber apparatus and will indicate the approximate percentage of butter-fat in the milk. Cheese-makers who so desire can be supplied with particulars of the specific gravity, fat content, other solids, and total solids, at the rate of 1s. per sample and 6d. for every additional sample.

**Milk Tests
for Farmers in
Somerset.**

It is of interest to note that for some years past the theory and practice of the Gerber tests have been taught at this school to the lads taking the third and fourth year in the Rural Economy class, so that when they leave school and go on to farms they are able to carry out tests for themselves. Public demonstrations of the method have also been given for a series of years at the Mid-Somerset Agricultural Show by the headmaster of the school.

The school has also for some years, in conjunction with the Mid-Somerset Agricultural Society, undertaken to test milk for farmers at 1s. per sample, but comparatively few farmers have taken advantage of the arrangement. In 1901 four farmers sent six samples of mixed milk, while in 1905 ten farmers sent twenty samples, fifteen of which were mixed milk, four were samples from single cows, and one was a sample of separated milk. It is hoped that the reduction in the fee charged may have the effect of encouraging Somersetshire farmers to make more extended use of the advantages placed at their disposal.

The fungus causing canker on apple trees, and less frequently on pear trees, known as *Nectria ditissima*, is a native of this country, and also occurs on oak, beech, ash, hazel, alder, maple, and lime, hence any attempt at extermination is hopeless. On the other hand, it is within the power of all those interested, by adopting proper precautions, to reduce the destructiveness of this parasite in the orchard to a minimum.

A series of careful observations, extending over several years, has revealed the fact that, out of the trees enumerated above, the apple is the only one on which the canker disease has assumed the proportions of an epidemic. This increase of canker on apple trees coincides with the rapid extension of the Woolly aphid (*Schizoneura lanigera*) in this country.

Canker fungus is a wound-parasite, that is, its spores on germination cannot pierce the unbroken bark and enter the living tissues of a branch, but can only effect an entrance through a wound made by some other agent. The minute punctures in the bark of young branches, also the gaping wounds and large rugged excrescences on older branches made by the Woolly aphid, are admirably adapted for enabling the canker fungus to gain an entrance to the living tissues of the branch. That this opportunity is not neglected is proved by the fact that in nearly every instance where canker on an apple tree is sufficiently recent to show how it gained an entrance, it can be traced to a wound made by the Woolly aphid.

The matter does not end here; when a tree is once infected, and the fungus produces spores, these are carried from one part of the tree to another by the aphid, and eventually an epidemic of canker is the result.

Of course, wounds caused by other agents, such as hailstones, the cracking of branches by wind, &c., furnish suitable starting-points for the entrance of canker; nevertheless, it is perhaps not overstating the case to say that if we had no Woolly aphid we should have no canker, at least not in the form of the destructive epidemics so prevalent at the present day.

Leaflets dealing with the Woolly Aphid (No. 34) and with Canker (No. 56) can be obtained on application to The Secretary, Board of Agriculture, 4, Whitehall Place, S.W.

An example of the successful establishment of a farmers' Co-operative Society on a comparatively large scale is afforded by the Eastern Counties Farmers' Co-operative Association, which was incorporated in March, 1904, and has recently issued its second annual report, covering a period of ten months to the close of 1905.

**Eastern
Counties Farmers'
Co-operative
Association.**

The position of the Association during those ten months is described as having been one of uninterrupted and unprecedented progress. On March 1st, 1905, the membership was 158, representing 61,620 acres, with a nominal capital of £1,540 10s., and the goods sold in the previous twelve months came to £15,400. On the 31st December last the membership was 289, representing 99,730 acres, with a nominal capital of £2,493, while the sales for the ten months amounted to £47,066.

The capital of the Society is raised by shares of the nominal value of 5s. for every ten acres occupied by members, of which 1s. 3d. has been called up, so that the paid-up capital is £650. The net profits, after providing for the payment of the working expenses and allowing for interest at the rate of 5 per cent. on the called-up capital, was £109, of which £11 was allotted as a bonus to the workers, and £80 was carried to reserve.

The Committee consider that the success of the business may be largely attributed to the fact that, owing to the support which members have given in the way of placing their orders with the Association, it has been able to secure competent and expert managers, whose services, in conjunction with those of the Trading Committee, renders the Association one of the best trading bodies working for the interests of the farmers in the Eastern Counties. The Association is, in effect, a large merchant working for the good of the farmer.

The relations of the Association with the wholesale merchants and manufacturers are becoming most friendly, and there are but few firms who will not now supply the Association on the best trade terms. Apart from the purchases made on behalf of members, the disposal of stock and produce is rapidly increasing. Over 5,600 coombs of cereals were sold during the last three months, together with quantities of clover and other seeds.

Here, as a rule, members have obtained very great advantages. The trade in pigs also forms an important branch of the business, the object aimed at being to obtain the most favourable markets for members' consignments, and to acquire the position and reputation of being consignors of best bacon pigs. Although the scheme has only been in operation a short time, there is ample evidence that better prices have been obtained than would have been the case had the pigs been marketed in the ordinary way. Pigs to the value of £17,352 were sold during eight months.

The number of small farmers who have joined the Association up to the present is insignificant, but the Committee specially mention that a man farming ten acres of land would be treated with the same consideration and would be able to purchase his requirements on equally advantageous terms as the man farming a thousand acres.

Enquiries have recently been made as to the methods adopted abroad for the protection of fruit trees from frost by smoke,

**Protection of
Fruit Trees from
Frost.**

and the Board have been informed by the Director of the Horticultural School at Ghent that the usual process followed in that country is to burn leaves, preferably from resinous plants, such as the yew. In France, use is made for burning of brushwood, damp hay or straw, or half-rotten dung, while heavy oils are also used occasionally. There are also several patent preparations manufactured in France for the production of a dense smoke, but these are rather expensive, and the tendency is to use these preparations less and to make use of chopped straw as an alternative. Several growers in England experimented in this direction last year with at any rate partial success, and the Board would be glad to be informed of the result of any experiments during the present spring.

ADDITIONS TO LIBRARY DURING MARCH.

Africa—

Cape of Good Hope.—Reports for half-year ended 31st December, 1904 :—
Government Entomologist. (12 pp.) Chief Veterinary Surgeon and Assistant
Veterinary Surgeon. (28 pp.) 1906.

Orange River Colony.—Report of the Technical Education Commission, August,
1905. (175 pp.)

Canada—

Department of Agriculture.—Report of the Director of Experimental Farms for
1904.

Nova Scotia.—Secretary for Agriculture, Report for 1905. (212 pp.)

Ontario Bureau of Industries.—Reports for 1903 and 1904. (214 pp.)

France—

Colliéz, André.—Les Associations Agricoles. (114 pp.) 1905.

Imbart de la Tour, Comte J.—Les Haras et les Remontes. (247 pp.) 1902.

Germany—

Müller, R.—Staats- und volkswirtschaftliche Einrichtungen zur Förderung der
landwirtschaftlichen Tierzucht insbesondere in Deutschland. (700 pp.) 1900.

Crüger, Dr. H.—Jahrbuch der Allgemeinen Verbandes der auf Selbsthilfe
beruhenden deutschen Erwerbs- und Wirtschaftsgenossenschaften für 1904.
(234 pp.) 1905.

Bussen, F.—Landwirtschaftliche Maschinen-genossenschaften. (110 pp.) 1905.

Grabein, Dr. M.—Stand und Erfolge des Genossenschaftlichen Getreideverkaufs
in Deutschland. (96 pp.) 1903.

Krische, Dr. P.—Die Untersuchung und Begutachtung von Düngemitteln,
Futtermitteln, Saatwaren und Bodenproben. (255 pp.) 1906.

Kaiserliche Biologische Anstalt für Land- und Forstwirtschaft. Arbeiten,
Heft 3 :—Versuche über die Wirkung der Strohdüngung auf die Fruchtbarkeit
des Bodens. (99-154 pp.) 1906.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 114 :—Vierjährige Hafer-
Anbauversuche, 1901-1904. (370 pp.) 1906.

Hechel, Dr. M. V.—Die Fortschritte der Direkten Besteuerung in den
Deutschen Staaten (1880-1905). (281 pp.) 1904.

Ekimow, Dr. I.—Das landwirtschaftliche Kreditwesen in Bulgarien. (120 pp.)
1904.

Jaffé, E.—Das englische Bankwesen. (245 pp.) 1905.

Kaufmann, H.—Geschichte des konsumgenossenschaftlichen Grosseinkaufes.
(287 pp.) 1904.

Great Britain—

Edinburgh and East of Scotland College of Agriculture.—Experiments with
Potatoes. Report, 1905. (25 pp.)

Heape, W.—The Breeding Industry. (154 pp.) 1906.

Jebb, L.—The Small Holdings. (48 pp.) 1906.

Holland—

Departement van Landbouw.—Varkenshouderij in Nederland. (63 pp.) 1906.

India—

Imperial Department of Agriculture.—Report for 1904-5. (126 pp.)

Switzerland—

Landwirtschaftliches Jahrbuch der Schweiz, 1905. (805 + 28 pp.)

United States—

Bureau of Animal Industry:—

Circ. 90. Suggestions for Construction of a Modern Dairy Barn. (6 pp.)
1906.

Bull. 78. Texas Fever. (48 pp.) 1905.

Bureau of Entomology.—Bull. 57. Report on Miscellaneous Cotton Insects in
Texas. (63 pp.) 1906.

Bureau of Plant Industry.—Bull. 100. Part I. :—Cranberry Spraying Experi-
ments in 1905. (8 pp.) Part. II. :—The Wrapping of Apple Grafts and its
Relation to the Crown-Gall Disease. (12 pp.)

West Indies—

Imperial Department of Agriculture.—Manurial Experiments with Sugar Cane in
the Leeward Islands, 1904-5. (51 pp.) 1906.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of March, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 8	7 2	36 1	33 2
Herefords	7 7	7 1	—	—
Shorthorns	7 6	6 11	35 5	32 7
Devons	7 9	6 11	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves	d. 8½	d. 8	d. 8½	d. 6½
Sheep :—				
Downs	9½	8½	—	—
Longwools	9½	8½	—	—
Cheviots	10	9½	9½	8½
Blackfaced	9½	8½	9	8
Cross-breds	9½	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	7 2	6 9	7 2	6 6
Porkers	7 9	7 5	7 9	6 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 8	17 2	21 9	17 1
„ —Calvers	19 3	16 13	17 17	16 8
Other breeds—In Milk ...	18 0	14 8	18 4	15 8
„ —Calvers	13 2	10 16	18 3	15 8
Calves for Rearing	2 1	1 12	2 13	1 18
Store Cattle :—				
Shorthorns—Yearlings ...	8 7	7 8	9 3	7 12
„ Two-year-olds	12 5	10 13	14 1	12 2
„ Three-year-olds	15 6	13 15	15 14	14 3
Polled Scots—Two-year-olds	—	—	15 10	13 8
Herefords— „	15 10	13 11	—	—
Devons— „	12 10	10 15	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	47 11	42 6	—	—
Scotch Cross-breds	—	—	38 1	33 6
Store Pigs :—				
Under 4 months	30 1	23 1	26 0	20 2

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of March, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	50 0	49 0	49 0	—	53 0*	51 6*
	2nd	48 0	45 0	44 6	42 0	51 6*	46 6*
Cow and Bull ...	1st	—	42 0	41 6	38 0	43 0	38 6
	2nd	—	37 6	37 0	34 6	33 0	33 0
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	47 6	46 6	46 0	46 6	46 0	—
	2nd	43 6	42 6	43 0	44 0	42 0	—
Argentine Frozen—							
Hind Quarters ...	1st	27 6	30 6	30 6	30 6	31 0	30 6
Fore „ „ ...	1st	23 6	24 6	23 0	23 6	23 6	23 6
Argentine Chilled—							
Hind Quarters ..	1st	32 6	35 0	35 6	33 0	37 6	36 6
Fore „ „ ...	1st	26 6	27 0	26 0	27 0	28 0	27 6
American Chilled—							
Hind Quarters ...	1st	49 0	48 0	49 6	49 0	49 6	49 0
Fore „ „ ...	1st	31 6	31 6	31 6	31 6	33 0	33 0
VEAL :—							
British	1st	75 0	71 0	74 6	80 6	—	—
	2nd	66 6	58 6	69 0	73 6	—	—
Foreign	1st	80 6	—	60 6	—	—	74 0
MUTTON :—							
Scotch	1st	77 6	69 0	80 6	80 6	72 6	70 0
	2nd	68 6	60 6	75 6	75 0	66 0	59 6
English	1st	72 6	70 6	74 6	73 6	—	—
	2nd	65 0	62 6	69 6	67 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	63 6	72 6	71 6	70 0	—
Argentine Frozen ...	1st	33 6	35 0	35 0	35 0	35 0	34 6
Australian „ ...	1st	30 6	31 6	32 0	33 0	35 0	32 0
New Zealand „ ...	1st	41 6	39 0	39 6	39 6	35 0	—
LAMB :—							
New Zealand ...	1st	51 6	53 0	53 6	53 0	56 0	50 0
Australian ...	1st	38 6	41 0	38 6	38 6	42 0	40 0
Argentine ...	1st	37 6	39 6	38 6	38 0	41 6	40 6
PORK :—							
British	1st	69 0	67 6	66 6	65 6	62 6	60 6
	2nd	60 6	59 6	61 6	60 6	59 6	53 6
Foreign	1st	66 6	59 6	59 0	58 6	—	51 6

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (in 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apr. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8			22	6	24	3			16	4	17	6		
" 21 ...	27	9	30	8			22	0	24	4			16	4	17	5		
" 28 ...	27	8	30	9			21	1	24	4			16	3	17	9		
May 5 ...	27	4	30	8			20	8	25	3			16	7	18	0		
" 12 ...	27	1	30	8			19	10	24	10			16	6	18	3		
" 19 ...	26	9	30	10			20	4	24	8			16	7	18	5		
" 26 ...	26	9	30	11			19	8	24	4			16	7	18	8		
June 2 ...	26	10	31	3			18	8	23	6			16	8	19	1		
" 9 ...	26	6	31	4			18	5	24	0			16	10	18	11		
" 16 ...	26	5	31	7			18	2	26	0			16	8	19	1		
" 23 ...	26	5	31	7			19	2	23	9			16	10	18	10		
" 30 ...	26	4	31	8			18	8	23	2			17	1	19	7		
July 7 ...	26	6	32	1			19	8	22	11			17	1	19	6		
" 14 ...	26	10	32	3			18	9	23	10			17	6	19	7		
" 21 ...	27	7	32	2			18	10	23	7			17	6	18	11		
" 28 ...	28	0	32	3			19	9	23	11			17	10	19	3		
Aug. 4 ...	28	3	31	11			19	9	22	0			17	10	18	4		
" 11 ...	28	4	30	5			19	9	22	5			17	7	16	11		
" 18 ...	28	8	28	5			22	5	23	4			16	7	16	4		
" 25 ...	29	5	27	1			23	2	23	6			16	5	15	9		
Sept. 1 ...	30	2	26	11			25	3	23	5			16	3	15	9		
" 8 ...	30	0	27	1			24	10	23	4			16	1	15	11		
" 15 ...	29	7	26	11			24	9	23	7			15	11	16	0		
" 22 ...	29	10	26	8			25	10	23	10			15	9	15	11		
" 29 ...	29	10	26	9			25	5	24	3			15	8	16	1		
Oct. 6 ...	30	2	26	9			25	6	24	9			15	9	16	3		
" 13 ...	30	5	26	11			25	4	24	10			15	8	16	6		
" 20 ...	30	4	27	1			25	5	25	0			15	11	16	7		
" 27 ...	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3 ...	30	6	27	10			25	0	24	9			16	0	17	1		
" 10 ...	30	3	28	3			24	6	24	10			15	11	17	4		
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	6	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: February ...	39 11	40 0	23 8	25 1	18 10	22 1
March ...	39 10	39 10	24 0	25 2	19 4	22 3
Paris: February ...	40 3	40 4	24 4	25 2	19 9	22 8
March ...	40 2	—	25 0	—	19 11	—
Belgium: February ...	30 0	30 11	23 5	24 4	19 10	21 9
Berlin: January ...	38 7 38 6	39 10 39 1	— —	— —	20 1 20 2	22 10 22 9
Breslau: January ...	36 5	35 6	25 7	25 1	19 6	20 7
February ...	36 1	35 3	26 5	25 1	19 10	20 8

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Monatliche Nachweise über den Auswärtigen Handel des Deutschen Zollgebiets*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of March, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	32 1	29 4	24 5	23 7	17 9	19 3
Norwich ...	31 2	28 4	25 0	24 7	16 6	18 2
Peterborough ...	30 3	27 8	23 7	23 3	16 7	18 3
Lincoln ...	29 8	27 8	23 5	24 0	16 5	18 3
Doncaster ...	29 1	27 10	24 1	24 6	16 2	18 7
Salisbury ...	30 3	28 7	25 1	25 2	17 0	19 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of March, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
British ...	14 0	12 6	—	—	—	—	14 6	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish ...	112 0	110 6	—	—	—	—	—	—
Danish ...	117 6	115 6	121 6	119 0	121 0	117 6	118 0	—
Russian ...	104 0	102 0	116 6	114 6	101 6	99 0	102 0	98 0
Australian ...	105 0	99 0	102 6	100 6	103 6	100 0	104 0	95 6
Argentine ...	108 6	107 0	105 0	103 6	105 6	102 0	106 0	—
CHEESE :—								
British, Cheddar	78 0	75 6	—	—	75 0	69 0	69 0	64 0
„ Cheshire	—	—	120 lb. 76 0	120 lb. 68 0	120 lb. 78 0	120 lb. 70 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	65 0	64 6	64 0	62 6	65 6	62 6	66 6	63 6
BACON :—								
Irish ...	67 0	65 0	67 6	64 0	66 0	63 0	—	—
Canadian ...	59 0	57 0	60 0	57 6	57 0	53 6	58 6	54 6
HAMS :—								
Cumberland ...	103 6	102 0	—	—	—	—	—	—
Irish ...	106 6	104 0	—	—	—	—	94 0	86 6
American (long cut) ...	53 0	52 0	55 0	50 0	53 6	49 6	54 6	50 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ..	9 9	8 1	—	—	—	—	—	—
Irish ...	9 4	7 9	8 3	7 9	8 1	7 6	8 1	7 6
Danish ...	9 6	7 10	9 2	7 7	—	—	8 4	7 7
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ..	62 0	52 0	—	—	75 0	65 0	58 6	48 6
Scottish Triumph...	62 0	55 0	57 0	43 6	46 6	41 6	—	—
Up-to-Date ...	70 0	60 0	61 6	52 6	43 6	38 6	40 0	35 0
HAY :—								
Clover... ..	90 0	79 0	91 0	81 6	84 6	65 6	78 0	71 6
Meadow ...	76 6	66 6	77 6	73 6	—	—	75 6	67 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	88	68	235	155
Swine Slaughtered as diseased or exposed to infection ...	400	414	1,047	755
Anthrax:—				
Outbreaks	103	113	259	278
Animals attacked	158	143	361	400
Glanders (including Farcy):—				
Outbreaks	103	107	286	289
Animals attacked	196	233	519	568
Sheep-Scab:—				
Outbreaks	58	140	245	547

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MARCH.		3 MONTHS ENDED MARCH.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	4	2	9	20
Swine Slaughtered as diseased or exposed to infection ...	62	9	214	196
Anthrax:—				
Outbreaks	—	2	2	2
Animals attacked	—	2	2	2
Glanders (including Farcy):—				
Outbreaks	1	3	2	9
Animals attacked	3	11	7	23
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	16	33	116	179

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THE USE OF WASTE ORGANIC SUBSTANCES AS MANURES.

There are several ways in which a manure may be beneficial, but in general most manures serve one or more of four purposes, which are :—

1. To increase the supply of plant food, either directly or indirectly, through the solvent action of the soil.
2. To improve the mechanical condition of the soil.
3. To hold up water in the soil and so ensure a constant supply for the plant.
4. To favour the growth and work of micro-organisms on whose activity the productiveness of the soil to a certain extent depends.

Mineral substances, with the exception of lime and basic slag, chiefly serve one function only, supplying plant food ; but organic substances, like dung and the products described in the following pages, act beneficially in all the directions enumerated above. They furnish plant food, but the proportions are not well balanced, and somewhere in the rotation the proper mineral substances have to be added if the best results are to be obtained. They have a marked effect on the mechanical condition of the soil : a heavy soil is lightened both by their mere presence and as a result of their decay ; and a light soil is improved by the cementing action of the glue-like colloidal humus to which they give rise. A good tilth is difficult to secure without organic matter.

One of their most valuable properties, and one in which they far surpass artificial manures, is their remarkable power of holding water. The water supply in many soils is insufficient for

securing maximum crops ; the manuring and cultivation adopted would give much better results if more water were present, provided, of course, it had no depressing effect on the soil temperature and air supply. This question will assume even greater importance as the necessities of the towns compel them to sink more and deeper wells in the country. Already in many districts the water level is lower than it was ; shallow wells are in consequence left dry and have to be deepened, and the supply available for the fields promises to be still further curtailed. Proper cultivation and the application of organic manures are two good ways of conserving the water supply.

Organic matter is not indispensable ; crops can be grown on an experimental scale without it. But the advantages of having some present and of replacing it as it disappears from the soil in consequence of bacterial and other actions are well recognised ; the farmer uses dung, and the manure manufacturer frequently puts organic matter into his compound fertilizers.

There are a number of waste products, used at present only in special branches of farming, some of which deserve a more extensive trial. This paper deals with certain substances used in the hop gardens of Kent and Surrey, but there is no fundamental reason why their use should be restricted to hops, and the writer has seen some of them applied with great advantage to other crops. Nor is their use confined to a particular type of soil ; they are generally applied to light chalky or sandy land, but this is by no means essential.

There are, however, certain drawbacks with regard to purchasing. The supply is somewhat irregular, and bulks are often not uniform ; it is difficult to draw a representative sample for analysis, and dealers often decline to give any guarantee as to composition. Competition from other quarters may force prices up too high, difficulties attendant on sanitary regulations may do the same, or they may act in precisely the opposite direction. There is no uniformity of price ; indeed, prices vary in neighbouring districts in an apparently haphazard way, and the personality of the buyer is an important factor. Little information is obtainable as to the relative manurial value of the various substances ; the usual pot experiments are not quite satisfactory, because sufficient account can hardly be taken of the power to hold up water. It seems certain, however, that,

provided the mechanical condition is satisfactory, these substances have more value than our text-books would have us believe.

The prices quoted in this paper are those which the practical hop grower in a position to make favourable purchases finds it worth his while to pay.

The substances dealt with fall into three groups :—

1. Residues from animal carcasses : Dried blood, feathers, greaves, hair waste, hoofs and horns, rabbit waste, slaughter-house refuse.

2. Residues from manufactures : Damaged cakes, shoddies, tannery waste.

3. Residues from towns : Destructor refuse, night soil, poudrette, sewage sludge.

I. RESIDUES FROM ANIMAL CARCASSES.

Dried Blood.—Without doubt this is an excellent fertilizer, and it is used by some manufacturers for their mixed manures. The price at which it is offered to farmers appears usually too high, in consequence, it is understood, of competition from America and the Continent. Thus a sample yielding 12 per cent. of ammonia was offered at £8 delivered in Kent, which works out to a unit price of 13s. 4d. The latest quotations seen have been even higher.

Feathers and Feather Waste.—Excellent results are obtained in some hop gardens by using about 20 to 25 cwt. of feathers, and the limited supply (amounting probably to only a few hundred tons a year) is rather keenly sought after. Large feathers are slow in action, the shafts especially taking a long time to decay ; a sample containing many of them is not as valuable as one composed mainly of small, more easily decomposable feathers. The ammonia obtained is usually a little over 10 per cent., a not uncommon price being £5 per ton delivered, giving a unit price of 10s. In spite of the generally good mechanical condition, one cannot help thinking this is too high. The price naturally fluctuates ; farmers have been known to pay £5 15s., while samples have also recently been offered at 70s. to 80s. At these lower prices, where the unit value is 7s. to 8s., feathers must be considered cheap.

Greaves.—Etymologically this word is the same as "gravy" ; it denotes the refuse or sediment left in making tallow or soap

grease. Clean samples, derived from butchers' fat and the trimmings of joints, are used as food for dogs, pheasants, and poultry; lower grades, obtained in melting down grease from other sources, are available as manure, and have been effectively used on hops, fruit, wheat, and other crops. The composition varies, and the fluctuation in price is considerable, 50s. to £8 being perhaps the outside figures, but it is not difficult to fix a maximum value for a particular sample, because of the close relationship between greaves and meat guano. The latter article consists of well-dried and finely-ground greaves mixed with bone meal; as a manure it is superior to ordinary roughly-ground greaves, and a higher price may reasonably be paid for the ammonia it yields. At present meat guano is being offered in Kent and Surrey at 10s. to 13s. per unit for ammonia and 1s. per unit for phosphate; it should be used in preference to greaves unless there is a distinct difference in price. The prices asked for greaves are sometimes excessive: a sample yielding 5 per cent. of ammonia and 5 per cent. of phosphate, and worth, on the above basis, from 50s. to 55s., was offered to the Wye College at £5! No doubt the varied uses of greaves as food, for meat guano, and as an ingredient of certain mixed manures had to do with the high price, which was asked in good faith by a local dealer.

Hair (Calf Hair, Hair Waste).—This yields about 12 per cent. of ammonia, but it does not easily decompose in the soil. As a rule the mechanical condition is very bad; the hair is matted in lumps which resist all ordinary farm appliances and absolutely refuse to break down. They may be in the soil for an indefinite time without perceptibly diminishing. I have known calf hair remain for two years in a hop garden and at the end of that time still yield 12 per cent. of ammonia when brought to the laboratory.

Having regard to its unsatisfactory mechanical condition, hair must be valued at less than feathers and much less than meat guano. I am inclined to think that 4s. or 5s. per unit of ammonia is fully as much as it is worth; this would make its value about 50s. or 60s. per ton. At the same time, if it could be supplied in a finely divided state it would be worth more; as it is, a higher price is often paid for it.

Hoofs and Horns.—The value of these is regulated mainly by

their fineness ; high grade samples of horn shavings and finely-ground horns yielding 15 to 17 per cent. of ammonia are largely used by market gardeners. On the other hand, *whole* hoofs and horns and materials like trotter scutch (consisting of hair, hoof, and bone), sometimes bought by farmers, are of little value until they have been finely ground.

Rabbit Flick (Rabbit Waste).—This consists of the ears, feet, tail, and various other portions of the outside of rabbits. The mechanical condition is usually very fair, but if the substance could be broken up a little more its value would be increased. It yields from 13 to 15 per cent. of ammonia, and sells at about £6 per ton ; the unit value of the ammonia is therefore about 8s. A certain amount of phosphate is invariably present. Rabbit waste is regarded by many practical men as quite a useful fertilizer ; its only drawback is that the supply is rather restricted.

Slaughter-House Refuse, Viscera, &c.—The proper way to utilize slaughter-house refuse is to convert it into meat meal or guano, in which form it can easily be carried about without interference from sanitary authorities. Where those who contract to clean out cattle markets have the refuse removed in barges it finds its way to waterside farms. It is worth about the same price as town stable manure.

Waste Fish.—East Kent farmers are very partial to waste fish as a manure, and the loads of sprats and of “five fingers” occasionally obtainable are disposed of without difficulty. Its use is not confined to hops ; I have seen it applied with great advantage to mangolds. Owing to its particularly penetrating and unpleasant odour it is, as a rule, only available in districts directly connected with the sea.

Fish guano and meat guano, although obtained from animal carcasses, have not been specifically dealt with in the preceding pages, because they are now definite manufactured manures and no longer waste substances.

2. RESIDUES FROM MANUFACTURES.

Damaged Cakes.—Occasionally, damaged cakes, or meals or cakes unsuitable for feeding purposes, are offered to farmers as manure, and where it is possible to have them finely ground they are very useful substances. Rape meal really belongs to this category, and in view of its uniformity may be taken as the standard in fixing a maximum price.

In Kent and Surrey (and no doubt elsewhere also) the price of a unit of ammonia derived from rape dust is about 20 per cent. higher than that of ammonia from fish guano, which in turn is somewhat higher than from meat guano. There is no *a priori* reason for supposing that the actual value as manure differs to this extent, and it is very desirable that the matter should be settled by properly conducted trials.

Among the samples known to be used as manure were several Bombay cotton cakes yielding $4\frac{1}{2}$ to 6 per cent. of ammonia, and 0.2 to 4 per cent. of phosphate; also certain compound cakes, falling within the same limits of composition, which had in some way got mixed with excessive quantities of sand. The precise value of these cakes cannot be fixed; 8s. per unit might be offered in the first place for the ammonia and 1s. for the phosphate, and the price finally agreed on should be well below that of rape meal.

Shoddy.—Writing a century ago about woollen rags, Young says in his "Farmers' Calendar" article (March): "They hold moisture, and are adapted for dry, gravelly, and chalky soils, and succeed in dry seasons better than most manures, but they do little good on wet soils. London rags are found much better than those collected in the country; but the danger of catching the small-pox in chopping and sowing them deters many farmers from their use." Six to ten cwt. per acre were ploughed in three months before sowing wheat and barley; one ton per acre was dug into hop gardens. The rags cost about £4 to £6 per ton on the farm.

To-day woollen rags usually go first to the manufacturer to be torn up, shredded, and again made into cloth, only the portions which cannot be utilized in this process being available as manure. Considerable admixtures of dirt, cotton, and occasionally oil, may be present, but the mechanical condition is, as a result of the shredding, excellent.

Shoddies may conveniently be divided into three classes:—

1. High grade, yielding 15 or 16 per cent. of ammonia, or, in the case of silk waste, 17 per cent.; the samples are clean and pure, and those sent to Wye College are often highly coloured. This class includes carpet waste and high quality cloth clippings. The supply is somewhat limited, manure manufacturers taking a

considerable quantity ; the price is therefore high, and varies between 7s. and 7s. 6d. per unit of ammonia.

2. Medium grade, yielding 6 to 9 per cent. of ammonia. The samples show considerable variation, and it is often difficult to get any guarantee about them ; the class includes wool combings, wool waste, flock dust, and the poorer qualities of cloth clippings. The supply is larger and prices are lower than for the higher grade, but samples are not always sold on the basis of their composition, and during the past year variations of from 5s. to 7s. per unit of ammonia have occurred. Probably 6s. might be taken as an average quotation.

These shoddies are widely used in hop gardens, and with such good results that they deserve a wider trial. We have seen them occasionally used with good effect on other crops ; they are not so slow acting as has sometimes been stated.

3. Low grade, yielding about 3 per cent. of ammonia. These are usually offered at from 4s. to 5s. per unit, and when this price includes delivery it cannot be considered high. The relative manurial values of low and higher grade shoddies in an ordinary rotation are being tested on the College farm.

Refuse from Tanneries.—Leather dust, yielding about 4 per cent. of ammonia, is occasionally offered to farmers, but the recorded experiments show that it has little or no manurial value. Occasionally one hears of the beneficial use of leather scraps in horticulture, but the results may quite probably be due to other causes.

Other tannery wastes do not appear to be much used by farmers, although some of them doubtless have distinct manurial value.

3. RESIDUES FROM TOWNS.

Destructor Refuse.—From the samples of this substance sent in to the College it cannot be supposed to have any greater value on the land than coal ashes of equal fineness.

Night-soil, Poudrette.—For many years it has been a standing reproach to our inventive capacity that the enormous quantities of night-soil obtainable in England should be almost entirely wasted. On the Continent efforts have been made to convert it into merchantable manures, either by dessication or by mixing with various substances, such as peat, ashes, slaughter-house

residues, blood, or phosphates, the mixture being known as poudrette. In order to prepare this substance it is obviously necessary to employ the pan system, and as this is not in general favour in England the application of the method here is limited. The pan system is still in vogue in many town districts, and in at least one place poudrette is manufactured. It is in very good condition, and yields about 8 per cent. of ammonia, 8 per cent. of phosphates, and nearly 3 per cent. of potash; excellent results have followed the use of 3 to 6 cwt. per acre.

In the absence of definite experiments on the subject it is difficult to fix a fair value for poudrette, *a priori* considerations being very apt to lead to fallacies. It is commonly supposed that anything which has passed through the human or animal body must have a higher manurial value than before, but even if this be true for the whole of the excreta it certainly is not the case for the solid portion. The easily attackable parts of the food are taken up by the body and reappear to a great extent in the urine; the more resistant portions constitute the chief part of the solid excreta. Any method for the agricultural utilization of the fæces is defective if it fails to collect the urine, and the practical difficulties of doing this are probably insurmountable.

If the quantities of poudrette available ever became considerable it would be a matter of great interest to compare it as a fertilizer with meat guano and fish guano.

Similar fertilizers of much lower grade, yielding $2\frac{1}{2}$ per cent. of ammonia and 8 per cent. of phosphate, are occasionally offered in Kent, but their value being low the cost of handling becomes proportionately higher.

Sewage Sludges.—In most towns there is a sewage system, and the production of poudrette is impossible. Attempts have been made to utilize the sludge deposited from the sewage, but so far as the writer is aware they have resulted in failure. The sewage contains so much water that the soluble available matter is washed out to form a hopelessly dilute solution; only the insoluble portion is left in the sludge, and one could hardly expect it to make a useful manure.

EDWARD J. RUSSELL.

POULTRY FATTENING.

Food is necessary to repair the waste of animal tissue, and if food be given in excess of these requirements the surplus goes to form extra flesh and adipose tissue or fat. This in a breeding fowl is unnecessary, and even bad ; but in a fowl destined for the table it is a desideratum, and when fattening is undertaken all the preconceived ideas of feeding with balanced rations, &c., must be thrown to the winds.

Fattening Period.—It must be clearly understood that fattening is an unnatural and artificial process, which cannot be carried out for an unlimited period, but which must be carefully and strenuously pursued up to the limit which is deemed advisable. This limit is fixed by the health of the bird, for no bird will stand more than a certain amount of close confinement combined with heavy and rich feeding. About three weeks has been found to be the most suitable period, but some birds are not able to bear the treatment as long as this. During this period nothing but the most nourishing food must be given ; that which produces the best results in this country has been found to be Sussex ground oats, mutton fat, and milk (usually skimmed).

Class of Bird Suitable for Fattening.—Before putting a bird up to fatten we must be sure that it is a suitable bird for the purpose, of the right age, and likely to do well. First of all it must be understood that all birds are not ready for the fattening pens at a given age. It is largely a matter of size, which is dependent upon a variety of circumstances, such as date of hatching, previous feeding, weather, &c. For instance, early-hatched birds, *i.e.*, those hatched in January, February, and March, are nearly always larger and more forward for their age than those hatched in May, June, and July, while September birds are smaller still.

Then, again, if the bird has been "pushed along," *i.e.*, fed well from the start, far less fattening is required, and the bird is usually large enough to go in the fattening pens earlier than is the case with a sparsely-fed bird, which has only had sufficient food to develop a good frame without much covering. In this connection it is well to note that a bird fed entirely

on grain will not be nearly as forward as a bird fed on soft food and grain. Experiment has proved that ground grain is not only more freely eaten, but makes birds plumper than whole grain.

All birds intended to be fattened should from the beginning be separated from the birds intended for stock, and be fed on a more generous diet, of which soft food forms the greater part, and if to the soft food be added a certain percentage of fat, so much the better, as far less trouble will be experienced in finally preparing the birds for table.

Best Age for Fattening.—Birds on a free range are usually more forward for their age than birds hatched and reared in confined runs, so that while from three to four months is the usual age at which a bird is ready to be fattened, size is, after all, the best guide.

An important point to remember is that at a given age a bird is in a condition to return its maximum amount of profit. Miss that time by a day, and that day's food is on the wrong side of the ledger. As the age of the bird increases it consumes more food, and so costs more to keep. On a given day each bird in turn reaches its highest state of perfection, after which not one ounce of food should be given it. It should be fasted for twenty-four hours, and then sold at once. Experience alone can enable anyone to decide when that crucial period arrives. The loss to a big fatterer on thousands of birds kept a few days beyond their time would be very large. There is, moreover, a double loss, for after a given time not only is a bird consuming unnecessary food, which costs money, but in addition it actually loses weight. There is also the cost of labour and the space it is occupying.

Unsuitable Birds.—Certain birds are unsuitable for fattening purposes. All birds intended for the fattening pens must be in a fair state of health, or they will not stand the strain. Very wild birds will not fatten well. Cockerels should not be over five months old. Feather-eaters must on no account be placed in the pens with other birds, as they will worry them by continually picking at their feathers, and so the whole pen of four or five birds will be retarded and food wasted owing to the birds not fully benefiting by it. Fighters must also be excluded.

Buildings and Pens.—The rooms or sheds in which the birds are penned must be kept scrupulously clean by continual lime-washing and the daily removal of all manure and stale food. The ventilation must be very free, but draughts must be avoided. The birds are usually placed in tiers one above the other, allowing room in front of each row for the food trough, so that starting about 3 ft. from the ground, each row of pens gradually comes nearer and nearer to the wall.

There should not be many windows ; one is usually sufficient, to give light to the attendant, and this can be draped when the birds have done feeding. When the birds are penned out of doors, as they often are in the Heathfield district, the fronts of the pens or cages must be furnished with curtains of any dark material—sacking will do, which must be let down when the birds have done feeding. The birds must not be allowed to see other birds running about, or be rendered fidgety and restless by looking at grass or other green stuff, for which they are sure to have a great longing ; this retards them considerably. Semi-darkness between meals, so that the birds may doze and digest their food, is an absolute necessity.

The above arrangement of pens applies where barns or sheds are utilized for fattening purposes. Where sheds are built purposely, it may be better to erect rather low sheds on the span-roof principle, allowing for only one tier of pens. This ensures more perfect ventilation.

The pens should be 20 in. high, 20 in. deep, and 7 ft. 6 in. long. These are divided into three cages ; each cage is then capable of holding four or five birds. They are usually made of a framework composed of any sort of stout wood—1-in. batten does well—the whole of the rest of the structure being composed of wooden rods. The rods are placed 1½ in. apart all over, except in the front, where they are about 2 in. The writer has found that batten used throughout is very serviceable.

The floors in the Heathfield district are made of wood about 1 in. wide on the top and 1 in. in depth, narrowing to ½ in. at the bottom to enable the manure to drop through more easily. Battens with the lower edges planed away do very well, whereas the above has to be specially cut.

Troughs.—Troughs in the Heathfield district are very often

cut out of a solid piece of wood ; but two pieces of wood placed at right angles so as to form a broad ∇ , and then closed at each end, answer the purpose. These may be held in position by hooks and eyes where there are several tiers, as each trough, except that in the lower tier, rests on the roof of the pen beneath. In the case of the lower tier, two projecting pieces of wood will answer the same purpose, hooks and eyes being again used to hold them upright. At Heathfield they often hang by cords. The troughs should be kept scrupulously clean, no stale food being allowed to remain in them.

Temperature.—Experiment has proved that the best temperature at which to keep birds, so as to secure the greatest possible increase of flesh, is 60 deg. Fahr. If the birds are kept in an overheated, overcrowded, stuffy shed, they will not fatten at all easily or well. On the other hand, if the sheds are draughty and cold in winter time, a good deal of the birds' nutriment goes towards supplying them with the heat that could easily be provided by a proper system of ventilation and adequate protection from the cold.

Single Pens Undesirable.—Birds do not fatten well if confined by themselves, as they are apt to pine. They thrive much better when four or five are penned together, as, being somewhat greedy, the sight of other birds eating causes each bird to strive to obtain its share. This proves a healthy stimulus to the appetite, and far more is eaten than would be the case were the birds penned singly.

Gain in Weight.—Experiments have been undertaken from time to time to determine the weight gained during the fattening period. There may be even a loss during the first few days, as birds do not always take to the new state of things. But if weight is lost during the first week, it is usually more than compensated for by the gain made in the second week.

During the first week there may be a slight loss or gain of weight, varying up to, say, 10 oz. The greatest gain is nearly always made in the second week, and may be anything up to 1½ lb. During the third week the gain is not nearly so great, but may be as much as ½ lb. Very few birds can stand more than three weeks' fattening, and if kept for four weeks they will probably lose weight, or gain very little, perhaps 1½ to

2 oz. Therefore, it is not advisable to prolong the process beyond a period of three weeks. The average gain in weight over the whole period varies from $1\frac{1}{2}$ lb. to $2\frac{3}{4}$ lb.

Feeding.—The best plan, and the one most frequently adopted, is to feed the birds from the troughs for ten days, after which they are crammed with the cramming machine for the remainder of the period of three weeks. Some fatteners cram the birds for a week or ten days only. A good deal depends on the bird.

Number of Meals.—When being fed from the troughs the birds should have two meals a day, the food being left until the birds have thoroughly satisfied themselves, after which it should be cleared right away and the birds left to digest their meal and drowse until the next.

Consistency of Food.—The consistency of the food during the trough-feeding period should be that of stiffish paste. A test of correct consistency is to take a handful and squeeze it. It should then pass through the fist in a thickish stream that will support its own weight to the height of about an inch before falling over. A further guide is that the bird when eating it should be unable to drag lumps of it into the cage. If this is possible, it is a sign that it is made too thick, and if it is too thin the bird will be unable to lift and swallow it properly.

There are three methods of cramming—by machine, by funnel, and by hand.

The Cramming Machine.—The method of cramming by machine is the one almost invariably adopted by English fatteners.

The cramming machines in general use have a round receptacle at the top which contains enough food for 100 to 150 birds. This is connected with a pump cylinder, the piston-rod of which is operated by a lever worked by the foot of the person using the machine. There is a nozzle, to which is attached a rubber tubing, and through this the food passes into the bird's crop when the lever is pressed down by the foot. Immediately the lever is released, the piston is forced by a spring to return to its original position in the cylinder, during which operation sufficient food passes down from the food receptacle into the cylinder, in readiness for the next feed.

The mode of operation should be as follows:—Lift the bird carefully from the cage, then place it under one arm, and hold it firmly but gently against the body. This obviates all struggling on the part of the bird. Then take the head of the bird in the hand of the same arm, so that the comb of the bird lies in the palm, and proceed to open the mouth with one finger, holding the tongue down. Now insert the tube. Immediately this is done, pass the head over to the other hand and, stretching the neck out, draw it towards the machine, until the tube has passed down into the crop. Then depress the lever, and the food passes into the bird's crop. One hand is, during this operation, holding the crop, where the end of the tube can be felt, and gauging carefully the amount of food received and required, which varies according to the size of the crop. When sufficient has been forced in, the foot is removed from the lever, and the bird then released. Care should be taken to remove the foot *before* releasing the bird.

The consistency of the food should be that of thick cream. Care should be taken to hold the tongue well down when passing the tube into the bird's throat, and to straighten the neck well, or accidents may occur.

The Funnel Method of Cramming.—The next method is by means of a funnel. The spout of this funnel is usually about 6 in. long, and $\frac{1}{2}$ in. in diameter. The spout of the funnel must be very smooth to avoid injury to the bird's gullet, and the outlet should be on the slant. The operation is as follows:—Insert the funnel so that it passes down into the bird's crop, and then with a ladle pour the food into the mouth of the funnel until the crop is felt to be full.

The consistency of food for funnel-feeding should be about that of thin cream. This is a much quicker system than that of hand-cramming.

Cramming by Hand.—The hand method consists of making boluses of food and then forcing them down the bird's throat. In this operation the bird is held between the knees. The head is held in the left hand, while the mouth of the bird is opened by the right, a finger of which is placed between the mandibles, care being taken to keep the bird's tongue down. The bolus is then dipped into a bowl of milk, and pressed by

the forefinger down the bird's throat. The bolus should be about $\frac{3}{8}$ in. thick, and about 1 in. long. The bird's neck is then drawn well up, so as to make an easy passage for the bolus, which is then pressed gently down into the crop by the forefinger and thumb of the right hand. The full meal usually consists of about twelve boluses, but judgment is of course required here. The hand process is said to produce absolutely the finest results, owing no doubt to the fact that a more concentrated meal can be given than by the machine, but although used on some farms, the process is too tedious to recommend itself to the large majority of fatteners.

Food to be Used.—So much for the actual operations of cramming; now as to the constituents of the food used. It consists, as already stated, of what is known as Sussex ground oats, or ground oats pure, and milk, usually skimmed milk.

Pure ground oats is one of the finest foods known, and approaches very nearly to a perfect food. Its analysis is:—Albumenoids 15 per cent., fats or oils 5.5 per cent., carbohydrates 48 per cent., and with the addition of mutton fat and milk it makes a perfect fattening mixture.

Sussex ground oats is not pure oatmeal, but has a certain admixture of barley, which enables the grinding process to be carried out more thoroughly owing to the dryness of the barley. The Russian oat is usually used, as it contains less moisture. It is the fineness of the meal that is supposed to cause such splendid results, owing to the ease with which it can be digested.

The milk is usually allowed to go sour before being used, and this, which would be fatal to young chickens, is believed by its action on the internal organs to prevent sickness and take the place of green food.

The mutton fat used is clarified and then stored away in barrels. If small quantities only are being dealt with, it can be placed to cool in pails. What are known as mutton trimmings, which can be obtained from butchers at about 2d. a pound, are suitable for this purpose, but where large quantities are used they can be bought from firms who ship the refuse of the American canning yards. The birds are usually given the fat when the actual cramming commences, and, beginning with a small amount,

are worked up to about $\frac{1}{2}$ oz. per diem. The fat should be melted down and then mixed in with the meal.

Latterly, a rough sort of Swiss milk, specially made for the purpose, has been tried, and those who cannot get a supply of skim milk might use it with advantage. But soured skim or whole milk should be used if procurable. If whole milk is used, fat can be dispensed with. Australian tallow, which is mutton fat, is also used largely in the Heathfield district. Where milk is unobtainable, molasses have also been tried, and sugar has been used by some. But it may be taken for granted that nothing is equal to the ground oats, milk, and mutton fat.

In place of ground oats the following mixtures are sometimes used, however, and have their advocates :—

1. Two parts of buckwheat meal, one part of maize meal, two parts of ground oats, mixed with soured skim milk or butter-milk.
2. A mixture of toppings, barley meal, and ground oats in equal parts.
3. Buckwheat meal, middlings, and ground oats in equal parts.

Maize meal is very useful, but, unfortunately, it creates a yellow greasy fat. Potatoes are useful for trough-feeding also, but fat must be added, as they have absolutely none in their composition, but contain 50 per cent. of water, the rest being mostly starchy matter, with 6·5 per cent. of albumenoids or flesh formers. They are very useful for turkeys and geese.

Suitable Breeds.—We come now to the most suitable breeds for fattening purposes. Of course all birds can be fattened, but some breeds are far more likely to make plump table birds than are others. The non-sitting breeds, in other words the layers, generally make the poorest table birds. Their surplus food and energy go in the direction of egg production, and they do not put on much flesh. All good layers are very active birds, and this very activity keeps them lean. They are usually more developed behind than in the breast parts, whereas the good table bird is generally more ample in front. The ideal table bird should be somewhat in the shape of a parallelogram with rounded corners, or, in the case of Game birds, in the shape of a fir cone, tapering gradually. It should have a long, deep, broad, nicely-rounded breast, the bone of which is long and

straight. The birds should be small-boned, with white skins and legs.

The best breeds for table are Dorkings, Sussex, Old English Game, Langshans, Orpingtons, Plymouth Rocks, and Wyandottes. The best cross-breeds are Old English Game—Dorking; Indian Game—Dorking; Faverolle—Buff Orpington; and Indian Game—Buff Orpington.

The Heathfield fatteners prefer the old Sussex breed, and next to that Brahma or Plymouth Rock crosses. Strangely enough, they do not like the Indian Game—Dorking crosses, although such birds often scale up to 10 lb. and more. Old English Game—Dorkings reach 7 to 8 lb.; Langshans, 10 lb.; Orpingtons, 7 lb. and over; Plymouth Rocks and Wyandottes, 7 to 8 lb. These, however, are special birds that have been well crammed. The Faverolle is a bird greatly favoured by the French, and it makes a capital table bird if crossed with the Buff Orpington. No chickens come so early to maturity. They are usually ready for the fattening pens long before pure Buffs would be, and they have good breasts.

It has been said that the non-sitters or layers, such as the Leghorns, make the poorest table birds; but if they are crossed, say with a Houdan, a fair bird for the home table can be produced. The Orpingtons, Plymouth Rocks, and Wyandottes are fair layers and fair table birds.

Superlative excellence both for laying and for table use cannot be expected in one and the same bird, so it is best to keep special breeds for table purposes if they are intended to be sent to market.

Cost of Fattening.—The cost of fattening will of course vary. A farmer who has his own milk, &c., will fatten cheaper than the man who has to buy everything. It is estimated, however, that the cost of fattening a bird for three weeks is about 5s. for food alone.

CECIL L. BYRNE.

LUCERNE AND TREFOIL SEED.

Lucerne (*Medicago sativa*), also called alfalfa or purple medick, was known and esteemed as a forage crop in Eastern and Southern Europe many years before the beginning of the Christian era. It was introduced from Persia into Greece and Italy, and the cultivation of this useful fodder plant spread throughout Southern Europe into Spain, and thence into France. It was long supposed by various authorities that the name "lucerne" was derived from the town of Lucerne, in Switzerland, but it is now believed that this is not so, and in the opinion

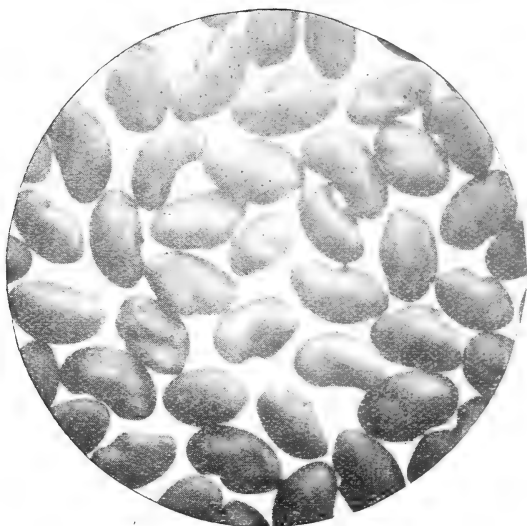


FIG. 1.—LUCERNE SEED (*Medicago sativa*) (magnified six diameters).

of some the name is rather a corruption of the old Spanish term *userdas*, which gives rise to the name *laouzerdo* used in the South of France, and from this the name of lucerne is derived. The other name, "alfalfa," is of Arabian origin, and by this name the plant was commonly known in Spain, and was thus introduced by the Spaniards into South America.

Lucerne is an erect-growing, branching, deep-rooted perennial, and was first cultivated as a field crop in this country about the year 1760. In the warmer, dryer districts of England, and in soils suited to its growth, lucerne takes high rank as a soiling crop, but even under such circumstances it has been insufficiently appreciated, doubtless owing to its somewhat peculiar demands upon soil and climate.

As regards the soil, the nature of the surface, whether it be heavy or light, is to a great extent immaterial ; the chief thing is that the sub-soil must be deep and dry, and easily permeable to the roots, and also that it be of a calcareous nature, or at least contain a sufficiency of lime, which is an indispensable element to healthy growth and a durable, persistent plant.

As previously indicated, dryness and warmth are absolutely necessary to enable this plant to attain anything approaching its maximum yield. In the dry genial warmth of the South of

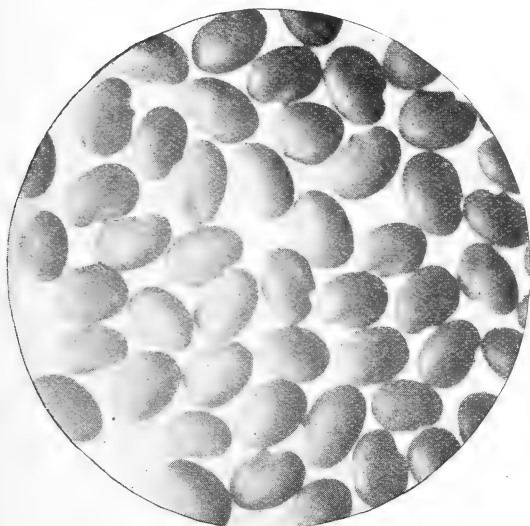


FIG. 2.—TREFOIL SEED (*Medicago lupulina*) (magnified six diameters).

Europe, lucerne produces a luxuriant crop, and, where the soil is both deep and warm, a permanent one, lasting from twelve to twenty years, or even longer. In our own country cold wet seasons, or a succession of them, are inimical to its healthy growth, and a period not exceeding from five to seven years is about the limit of its duration.

Though lucerne is far too little cultivated, the acreage during recent years has been increased very considerably, as the following figures will show. In the year 1892 the entire area in England sown down in lucerne only amounted to 16,583 acres ; in 1896 this had increased to 27,188 acres, while in 1905 the figures given were 53,400 acres. Though the acreage has thus increased, it is mainly in the Eastern and South-Eastern counties that it

is most highly esteemed, the counties of Kent and Essex alone accounting for nearly one-half of the total area, or 24,753 acres.

There is little doubt but that the cultivation of this valuable forage plant has been attempted in districts and soils unsuitable to its growth, and the cause of failure has been due, in a certain degree, to a lack of knowledge of the plant's requirements. The increased area sown is, however, direct evidence that these requirements are becoming better known and appreciated by the farmer.

Lucerne, while belonging to the same family of plants as the

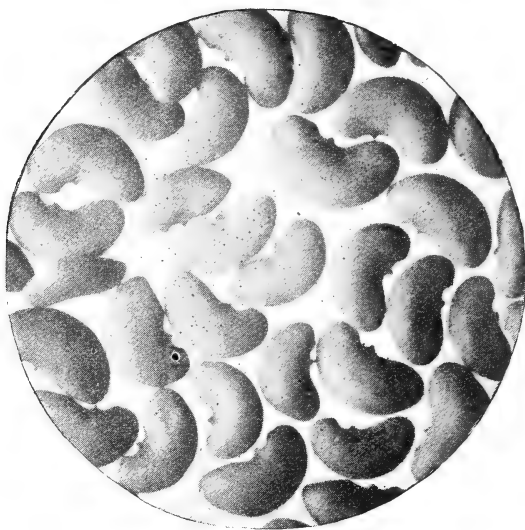


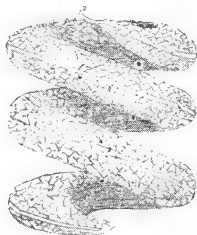
FIG. 3.—SPOTTED MEDICK (*Medicago maculata*) (magnified six diameters).

cultivated clovers (*Leguminosæ*), is, with trefoil (though there is not much apparent affinity between them) a member, not of the genus *Trifolium*, as might be supposed, but of the genus *Medicago*, the one *Medicago sativa* (lucerne or purple medick), the other *Medicago lupulina* (black medick or trefoil).

The deep-rooting habit of lucerne, and its capacity on that account of withstanding prolonged drought, are among its most valuable characteristics. The tap-root, in suitable soils, becomes strongly developed, and descends to a depth of two feet or more during the first season's growth, and in a deep, genial sub-soil, containing a fair amount of lime, roots penetrating to a depth of ten to twelve feet have frequently been traced. When grown



Bokhara Clover.



Lucerne pod.



Trefoil.



Lucerne.



Trefoil pod.



Bokhara pod.



Ox-tongue.



Knot-Grass.



Lucerne



Trefoil.



Field madder.



Curled Dock.

Yellow
Centaurea.

Geranium.

SEEDS COMMONLY FOUND IN SAMPLES OF LUCERNE AND TREFOIL SEEDS.
(Each seed drawn to scale and magnified six diameters.)

under such favourable conditions it is not surprising that its growth is both luxuriant and lasting, for when once thoroughly established it readily withstands the severest drought, and produces an abundant feed. After the first year it may be cut three or four times during the season. Moreover, it is especially worth cultivating, as both horses and dairy cattle eat it with avidity.

Lucerne, whether sown alone for cutting or in mixtures for permanent pastures, is also specially valuable for the twofold reason that, as a leguminous plant, it very materially aids in the conservation of soil nitrogen, and that, as it is a very deep-rooting plant, it taps an otherwise inert store of fertility which lies deep down beyond the reach of ordinary agricultural plants.

The advantage of growing lucerne within easy reach of the farm buildings is manifest, for it is essentially a crop to be cut and carried, depasturing being, in a sense, inimical to its permanence, as when too closely eaten by sheep the young buds at the base, which would ultimately form new branches, are destroyed.

The seeds of lucerne, owing to the peculiar twisted character of the seed-pod, are perhaps more irregular in shape than the seeds of any other cultivated clover.

From the somewhat general similarity in outline (though not in size) between the seeds of lucerne (*Medicago sativa*) and other species of the same genus, viz., trefoil or black medick (*Medicago lupulina*), spotted medick (*Medicago maculata*), and denticulate medick (*Medicago denticulata*), it has been thought desirable to include several micro-photographs (Figs. 1-4) of the same magnification, so that the variations in shape and size of individual seeds of the same sample, as well as the differences between seeds of one sample and another, may be readily seen. In each pod there are several seeds of lucerne, and these are yellowish-brown or green in colour, the surface being smooth and dull. All samples contain a varying proportion of kidney-shaped seeds, as well as seeds irregular and angular in outline. Though some of the smaller irregular seeds bear a certain resemblance to the seeds of red clover, those accustomed to handling these seeds have no difficulty whatever in distinguish-

ing one from the other. Should they be mixed together by accident or design, the colour of lucerne seed in itself is sufficient, in that it is uniformly yellowish throughout the entire seed. The appearance of the seed, its colour, uniformity, bold character, and freedom from brown or dead seeds, are all points indicative of commercial worth.

In examining a sample of lucerne seed to determine its purity the first and most obvious question is whether it is genuine, and secondly comes the constantly recurring question—



FIG. 4.—DENTICULATE MEDICK (*Medicago denticulata*) (magnified six diameters).

Is it free from dodder? As regards genuineness, the writer has on several occasions found that the seeds of spotted medick and denticulate medick have been used to adulterate the true lucerne—or entirely substituted for it—and sold on the English market as Chili lucerne.

Dodder (of whatever species) is, as a rule, fatal to the sale of the seed containing it when its presence is once known to the buyer. In the writer's opinion, however small the quantity, it is not a safe purchase, and this view of the matter is held by many of the largest seed merchants in the market, and is borne out by the oft-repeated statement: "If the sample contains dodder, even only a trace, I will not touch it at any price."

The farmer, in purchasing lucerne, as other seeds, from seed

houses of repute, and paying a fair price, has, in a degree, a guarantee of freedom from dodder and other objectionable impurities. It is sometimes difficult to recognise the seeds of dodder in a sample of clover or lucerne. The colour of the dodder seeds varies from a dark yellow to a light grey or brown, while the surface is dull and somewhat rough or pitted. In some cases it is impossible from appearance to say whether one is looking at a seed or at a small spherical pellet of soil, until one presses gently the suspected seed under the blade of a knife; if it is soil it crumbles into pieces, if a seed it may, under microscopic examination, prove to be dodder (Fig. 5).

The seed supply of lucerne is mainly, if not entirely, from the continents of Europe and America, and unquestionably the best and purest seed offered in this country is grown in France, in the district of Provence.

Some of the impurities common to lucerne are Bokhara clover (*Melilotus alba*), *Polygonum aviculare* (knotgrass), *Rumex crispus* (curled dock), *Helminthia echinoides* (ox-tongue), and *Centaurea solstitialis* (yellow centaurea), the two latter being frequently found in French seed; other impurities commonly met with are *Plantago lanceolata* (rib grass), *Rumex acetosella* (sheep's sorrel), *Chenopodium album* (goose-foot). When seeds of lucerne are analysed they should be closely scrutinized for Bokhara clover, as this is an undesirable plant, even in very small quantities, on account of its poor quality as a forage crop and its unsightly wiry growth towering high above the lucerne. When Bokhara clover is mixed with lucerne it becomes a matter of judgment and experience to detect it readily. The colour of individual seeds is uniform throughout—yellowish-brown or yellow tinged with green, the former colour mostly predominating in samples of Bokhara. The micro-photograph of Bokhara clover (Fig. 6) shows its slightly varied form. The shape is oval-oblong, and the sides, as can be seen, are slightly depressed or flattened, the faint groove indicating the position of the radicle.

The seeds of trefoil (*Medicago lupulina*) are also found in lucerne, and on account of the colour and size of the grains they may easily be overlooked unless closely examined.

The purity of good commercial seed should be high—at least 96 per cent. pure. In the best seed 98 per cent. or 99 per cent.

can be readily obtained, and the germinating capacity of ordinary quality seed should be at least 85 per cent. or 90 per cent., while in the finest samples there is no difficulty in obtaining a guaranteed germination of 97 per cent. or 98 per cent. In testing the germination of lucerne, the energy is noted and reported after three full days and the full germinating capacity in ten days.

Medicago lupulina (trefoil) is a fibrous-rooted, hairy, biennial plant, with prostrate, spreading stems, and is variously known

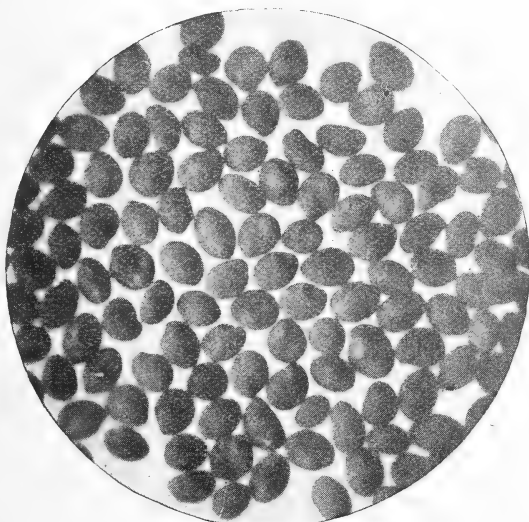


FIG. 5.—DODDER SEED (magnified six diameters).

in different parts of the country as hop trefoil, black medick, nonsuch, &c.

Trefoil bears a strong resemblance to yellow suckling clover, but the distinctive hairiness, the projecting midrib of the trifoliate leaves, the curved and blackened seed-pod, and the falling away of the bright yellow corolla of the trefoil, render it easy to distinguish the one from the other. Trefoil thrives on most medium soils of a calcareous nature, and though neither very productive nor persistent, produces a fair amount of useful nutritious herbage. On account of the prostrate, spreading character of the stem, it is more suitable for grazing land, when sown in mixture with other clovers and grasses, than for a hay crop. Trefoil, though primarily adapted and most

valuable for alternate husbandry, is also useful in small proportion in permanent mixtures, as upon congenial soils it propagates itself by seed in an unobtrusive way so as to become practically permanent. Though not standing up well to the scythe, trefoil is a palatable addition to the first, and perhaps second, year's crop, at the same time helping to form a compact bottom.

The seeds of trefoil are smaller than lucerne, having a smooth, shiny surface, and in fresh new seed are greenish-yellow in colour. The projecting tip of the radicle so characteristic of this species

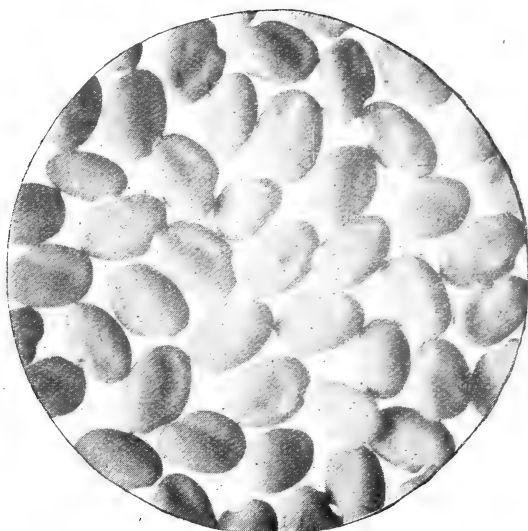


FIG. 6.—BOKHARA CLOVER SEED (*Melilotus alba*) (magnified six diameters).

enables one to recognise it readily. The plumpness, good colour, and brightness of the seed, or the reverse of these desirable features, are useful guides as to the quality of any sample, and old seed is quickly detected by the lack of lustre and its dull brown appearance.

Trefoil, on account of its low price, is never adulterated; being cheap it rather offers an inducement to the unscrupulous vendor to use it as an adulterant in higher-priced clovers.

The impurities most met with in samples of trefoil are the oval, oblong, brownish seeds of *Plantago lanceolata* (rib grass), easily determined by one surface being convex and shiny, and the other side concave. There are also found the ripened half-

fruits or carpels of *Sherardia arvensis* (field madder), one side of which is rounded and the other flat and furrowed, some of the seeds being covered with short white hairs, while the three sharp hard points of the calyx leaves at the top are well defined. The seeds of *Geranium dissectum* (cut-leaved geranium), are also found, and are known by their oval shape, greyish-brown colour, and pitted or net-marked surface. The purity of trefoil at a fair price is, as a rule, high, and there is not any difficulty in obtaining seeds having a purity of 98 per cent. or 99 per cent. The germination of seed of average price can also be depended upon to equal 94 per cent. or 95 per cent.

D. FINLAYSON.

The residual value of manures or the extent to which their effects are felt in years subsequent to their application is a subject of great agricultural interest, but at the same time one of some difficulty, as in order to eliminate as far as possible separate factors, such as peculiarities of soil and variations of climate, the experiments require to be continued for a series of years. This has been the case in a set of rotation experiments which form the subject of an exhaustive report by Professor Gilchrist, of Armstrong College, Newcastle-on-Tyne. Here six separate centres were available, in two of which the trials have extended over twelve years (three rotations), and over ten years (two rotations) at two others, the remainder representing one rotation each of four or five years. The experiments are of too extensive a character to be summarized here, but the general conclusions at which Professor Gilchrist arrives can be understood without reference to the experiments in detail.

It is evident, for instance, that if soil is allowed to run down in condition it takes a long time to bring it again into "good heart." This is shown by the steady increases in the gains during the twelve-year experiment. These increases are largely the result of comparison with the unmanured plot, which has been undergoing a gradual exhaustion.

In the majority of cases the manures applied for swedes have

had considerable effects as far as the fourth and fifth following crops. The increases in value in the crops of one rotation were very considerable from both dung and artificials applied during the first rotation.

While these trials show such good after effects from manuring, they emphasize the need of the regular application of manures, and they indicate that crops benefit greatly from the residue of manure applied many years previously, as well as from direct manuring. In other words, good farming means an accumulation of soil fertility. Further, if this good farming is not continued the soil will, after a time, produce smaller crops, and these cannot be increased immediately to the normal by heavy direct manuring, but only after a continuation of liberal manuring for some years.

From the averages of the results it is evident that about half of the increases in value are obtained by the root crop, taking into account the delay of two or more years in obtaining the increases in values of the later crops. When, however, the roots are eaten off on the land by sheep, especially if cake is also fed to the sheep, the manurial value of these foods should be added to the value of the residue of the manure applied for the roots. On the lighter and more hungry soils an even greater proportion of the increase in value is likely to be returned by the root crop.

The remaining half of the increases in values are fairly well distributed over the remaining crops of the rotation, and become gradually reduced. At one centre, however, the gains up to the fifth crop were remarkably high.

There is no advantage, but the reverse, from distributing the manures over all the crops, and in addition to this, the cost of this method of application is very much greater. The extent to which any small distribution may take place is indicated in the suggestions for manuring given below.

When artificials only are used a potash manure is essential on light soils and may be useful on heavier soils, but when dung is used in addition the potash manure may not be required. Basic slag is often more profitable than superphosphate on arable land. When swedes are fed off with sheep receiving cake it may be advisable on good soils to take two white crops before sowing down with seeds.

Suggestions as to Manuring.—When practically all the manures for a rotation of crops are applied to the root crop it is evident from the results that the needs of all the crops must be considered, as well as the special requirements of the first crop (roots), to which too much attention is now commonly given.

Artificial Only.—All the results show the imperative need of a potash manure on light and even on loam soils when dung is not used, and also indicate that basic slag is usually better in the long run than superphosphate, but that either of these is more economical than dissolved bones or bone meal. It is also clear that a larger amount of phosphoric acid should be used in slag than in superphosphate, when either is applied in the quantity which will give the best results. It is probable that 4 cwt. basic slag, $1\frac{1}{2}$ cwt. superphosphate, $\frac{3}{4}$ cwt. nitrate of soda, $\frac{1}{2}$ cwt. sulphate of ammonia, and 1 cwt. muriate of potash (50 per cent. potash), all applied in the drills, represent a fair dressing for swedes and turnips in the North of England, where so many of the soils are poor in lime.

For potatoes the potash manure might be increased by one-half and either a light topdressing of nitrate added when the crop is above the ground, or $1\frac{1}{2}$ cwt. of a good guano added in the drills.

For mangels there should be added 2 cwt. common salt in the drills, and $1\frac{1}{2}$ cwt. nitrate of soda, in two topdressings, after the crop is above the ground.

For cabbages a dressing somewhat the same as for mangels is likely to be useful.

On the lighter soils a dressing of 3 cwt. slag and 2 cwt. kainit on the young seeds, immediately the corn crop is removed, is likely to be useful, especially if clover is abundant. If in the spring the young seeds are found to be principally grasses, $\frac{3}{4}$ cwt. of nitrate as a topdressing will be useful.

Dung and Artificial.—When good dung is used in moderate quantities, the need of a potash manure largely disappears, even on the lighter classes of soils. Good returns may also be expected from medium dressings of dung, especially on thin hungry soils. Heavier dressings may also give good returns, but not to the same extent per ton as lighter dressings. Dung

only may give nearly as good results as dung and artificials on the following root crop, especially if this is swedes, but when all the crops of the rotation are taken into account there is a distinct advantage in the combination. Professor Gilchrist therefore suggests that 10 to 12 tons dung, 4 cwt. slag, $1\frac{1}{2}$ cwt. superphosphate, $\frac{1}{2}$ cwt. nitrate, and $\frac{1}{2}$ cwt. sulphate of ammonia, represent a fair dressing for swedes and turnips. The artificials would all be applied in the drills and the dung in the drills or previously.

For potatoes, 1 cwt. muriate of potash in the drills, and $\frac{1}{2}$ cwt. nitrate as a topdressing afterwards might be used in addition. For mangels, 2 cwt. common salt and (on light soils only) 1 cwt. muriate of potash may be added in the drills, and $1\frac{1}{2}$ cwt. nitrate in two topdressings afterwards; and for cabbages somewhat the same manuring as for potatoes may be adopted.

On the lighter and more hungry soils it may be advisable to apply dung and only part of the artificials to the roots and to reserve the greater part of the slag, half of the potash manure, and a small part of the nitrogenous manures for the seeds hay.

Nitrate of soda or sulphate of ammonia may be used with advantage to a moderate extent only as topdressings for the hay and cereal crops when necessary. The results indicate that no disadvantage follows from the use of these when a system of liberal manuring is adhered to, but that they have not good effects when the soil is in low condition, or when continued without other manures.

The foregoing suggestions are framed so that they may admit of easy modification. Local circumstances and prices must determine which manures it will be advisable to use.

Some experiments have been carried out at the Federal Institute of Agricultural Chemistry at Lausanne* with a view of testing the value for agricultural purposes of the liquor from gasworks. The water used in the purification of coal-gas contains, among other products, a small quantity of ammonia, and that

* *Bull. Mensuel*, French Dept. of Agric., March, 1906.

used in these experiments yielded from .34 to .427 per cent. of ammonia. In large works this water is treated with lime, and yields a concentrated liquor which is sold to chemical manufacturing for the production of sulphate of ammonia, but in small gasworks this cannot always be done profitably, and the liquor is allowed to waste. In some places, particularly in German Switzerland, this liquor is given to farmers, who apply it to pasture land in winter, either directly or mixed with liquid manures.

The experiment was carried out on a meadow which had received a dressing of superphosphate and potash; it was divided into plots of about 100 square yards each, which were watered on 20th March and 8th of June, that is, before and after the first cutting, with progressive quantities of the ammoniacal liquor. The first watering took place immediately after the application of the fertilizers, while the second was preceded by a dressing of lime with the view of fixing the volatile ammonia in the water.

At the time of the first watering the grass had begun to grow and was slightly burnt, but it quickly recovered and grew with renewed vigour. At the time of cutting the plots watered with large quantities were noticeable at a distance for the length, abundance, and greenness of the crop. The yields of dried fodder were as follows :—

	Yield of hay per acre.				Total.	
	1st cutting.		2nd cutting.			
	cwt.	qr.	cwt.	qr.	cwt.	qr.
1. Without watering	34	2	9	1	43	3
2. 440 gallons per acre	35	2	9	3	44	5
3. 880 gallons	37	2	12	2	50	0
4. 1,320 „	42	2	15	2	58	0

The application at the rate of 440 gallons per acre produced only a very slight increase; but three times that quantity resulted in an increase of 14 cwt. 1 qr. per acre, an excess which well repaid the cost of the transport and distribution of the water, which was obtained free from the gasworks.

The use of this gas liquor affected the botanical composition

of the herbage, leguminous plants, clovers, vetches, &c., tending to disappear in favour of gramineous grasses; this, however, seems merely due to the nitrogenous character of the manure, and may be partly counterbalanced by the simultaneous application of phosphates, potash, and lime.

Apart from these experiments, instances are mentioned where this liquid is used in practice with satisfactory results, being mixed with liquid manure and applied in winter, when there is no danger of burning the herbage.

Red clover is found wild in pastures in Britain, Europe, Northern Africa, and the temperate parts of Western Asia, and it has been introduced into North and South America, and also into New Zealand.

**Trials of
Different Varieties
of Red Clover.**

In order to satisfy the demand for seed in this country, and to supplement the home supply, considerable quantities are imported from the United States, Canada, Chili, New Zealand, Russia, Bohemia, Bavaria, and elsewhere. An account of the impurities which are met with both in the home and imported seed formed the subject of a recent article in this *Journal* (March, 1906, p. 716), and attention was drawn to the importance of having samples tested both for purity and germinating power. The information therein given may usefully be supplemented by some notes from the report of trials carried out by the Agricultural Department of Leeds University for the purpose of comparing the crops obtained from home and foreign grown red clover seed.

The experiments have been carried out at various centres, but the notes of observations on the growth of the crops refer chiefly to those grown at Garforth and Leconfield in 1902, 1903, 1904, and 1905.

English Red Clover.—This seed was from English-grown stock of high quality, and suitable for one year's cutting only. It gave an average weight of hay almost every year. The best year was 1902, when it gave an exceptionally heavy crop ($3\frac{1}{2}$ tons) at Leconfield and at Garforth. In the autumn of 1901 the plots were good and stood the winter well. In the autumn reports of the other years this plot was frequently

reported to be thin and patchy, so that English red cannot be regarded as one of the best for autumn stubble grazing. It is hardy during most winters, but on the strong land of Field 33 at Garforth it suffered severely from a dry autumn and foggy winter. It resists clover sickness well, and it is noteworthy that in the nationality test made in 1900-1901, when all the plots were much damaged by clover sickness, the English red plot remained the healthiest. In a good season this clover may grow tall, but it does not attain the same height as Chilian or Canadian. It carries much foliage and gives a good weight of hay. In 1903 this clover gave a good crop of aftermath (3 tons).

Giant Hybrid Red Clover.—This is said to differ from English red clover, on account of its stronger growth. At Garforth the crop in 1902 and 1903 was above the average, and exceeded the English red, but in 1904 and 1905 the crop was poor. At Leconfield the hay yield was only about an average, but was never greater than the English red. Most of the autumn reports are unfavourable, the plot lacking density, hence this clover is rather uncertain for autumn stubble grazing. In 1903 the aftermath was very heavy (4 tons 7 cwt.), after a good first cutting.

English Cowgrass.—The yield of hay at Garforth was below the average every year except 1905. At Leconfield an average crop was given each year. The autumn reports generally state that this plot was satisfactory as to density, but the plant was never tall. This cowgrass appears, therefore, to have some value for autumn stubble grazing. The spring reports, on the other hand, note lack of uniformity, so that this clover is not one which stands the winter well, and although it has frequently looked better than the single cut cowgrass in May and early June, it has always been much inferior in yield of hay. It gave a low weight of aftermath ($2\frac{1}{4}$ tons) in 1903.

English Single Cut or Late Flowering Cowgrass.—This is regarded as more perennial than the foregoing. It always gave the heaviest yield of hay, except in 1904, when it was exceeded by Canadian. The crop average for four years at Garforth was nearly $3\frac{3}{4}$ tons, and in 1903 it reached $4\frac{1}{4}$ tons. This clover has little to recommend it for autumn stubble grazing, for every autumn it has been reported as small in size of plant and as a

rule not covering the ground well. In early summer it grows slowly and compares badly with the more luxuriant growth of other clovers. It is, however, a very reliable variety, and in spite of unfavourable autumn and spring reports it grows well in June and July and produces a dense uniform plot of heavy hay.

A moist summer appears to suit this variety best, as in the wet summer of 1903 it produced its heaviest yield of hay, while in the dry year of 1904 the crop was much reduced, although the yield ($2\frac{3}{4}$ tons) was still a good crop in comparison with the other plots. The aftermath in 1903 was very poor ($1\frac{1}{2}$ tons); in the same season giant hybrid and Chilian gave $4\frac{1}{2}$ tons.

Chilian Red Clover.—This has been one of the most attractive plots on account of the fresh colour and the size of the plants. In spite of this the yield of hay has only been about an average one each year. In all the autumn reports the plot has been stated to be one of the best. At this season it is vigorous and soon becomes covered with new foliage after the corn harvest. For autumn grazing it is one of the best of the clovers tested. It stands the winter well, and in spring the plot is still fresh looking. During the summer months the plots tended to lose density, especially in the dryer seasons of 1904 and 1905. Compared with single cut cowgrass, the Chilian increases more rapidly in height and carries larger leaves, but most of the reports note a scarcity of foliage near the ground, which is probably due to the shade cast by the tall leafy stems. On the whole this clover excels the others more as a grazing clover than as a hay producer. In 1903 the yield of aftermath was about $4\frac{1}{4}$ tons. It is to be noted that samples frequently contain a species of dodder.

New Zealand Red Clover.—In size and appearance this is very similar to Chilian, and the hay yield was about the same. The plant is vigorous and suitable for stubble grazing. The plots in summer have as a rule lacked density, and although the plants are tall the yield of hay is only moderate. The seed is free from dodder.

Canadian Red Clover.—This clover produced the heaviest aggregate weight of hay of the foreign seed, and was only exceeded by the single cut cowgrass. Before cutting, the plant is tall like Chilian but carries more foliage near the ground, and

gives a greater weight of hay. It is also one of the early flowering varieties. For stubble grazing it is much inferior to Chilian or New Zealand, and is on the whole unsuitable for this purpose, but it is one of the best and most reliable hay producers, and yields a good aftermath.

United States Red Clover.—This is very similar to Canadian in size and appearance. The aggregate weight of hay for the four years at Garforth is less than, but at Leconfield is almost the same as, Canadian. In the dry seasons it gave at Garforth less hay than Canadian, but in the two wet seasons it was heavier. The autumn reports show that it grows poorly, so that it is unsuitable for stubble grazing.

Russian Red Clover.—This is distinguished from the other three European clovers by its larger leaf, taller growth, and later flowering. The poor appearance of the plots almost every autumn indicates that this clover is not to be relied on for stubble grazing. It does not grow much in spring, but with a moist summer, as in 1902 and 1903, it becomes one of the tallest of the clovers and yields a heavy weight of hay. In dry seasons the crop is less, but is still up to the average weight of the plots for these years. The merits of this clover, however, are discounted by the fact that the seed of the Russian clover has always contained more impurities than any other clover tested. In 1902 it had about 5 per cent. of weed seeds and other impurities, while the other samples tested did not exceed 1 per cent. The black seeds of European dodder are frequent in Russian samples. The clover seed itself is generally small, and the samples frequently contain a large proportion of immature, dead and hard seeds. This clover cannot therefore be recommended unless the seed is well ripened and free from impurity.

Bohemian, Styrian, and Bavarian Clover.—These three European clovers are so similar that they may be considered together. As regards height of plant at cutting, these are the lowest of the clovers tested. They are generally reported to have a good appearance in autumn but they are much behind Chilian; the reports, however, show that these clovers are suited for stubble grazing. All three gave their heaviest yield of hay in the wet seasons of 1902 and 1903, and were distinctly lower in the two dry seasons.

United States.—The May Report of the Department of Agriculture, as reported in the *Times*, gives the area under winter wheat at the beginning of the month as 29,623,000 acres. This is 241,000 acres less than the area harvested last year. The average condition on May 1st was 91, compared with 92·5 on the same date last year. The average condition of winter rye was 93, against 93·5 at the corresponding date in 1905.

**Notes as to
Foreign Crop
Prospects.**

Russia.—The Board have received through the Foreign Office a report translated from the official *Commercial and Industrial Gazette* of March 30th, O.S. (April 12th). It states that the prospects in thirteen southern and ten Polish Governments are very good. The early spring at first aroused anxiety in some places in consequence of late frosts, but these fears have been dispelled in the southern Governments, at least for the winter sowings, as the latter are now well advanced in growth. There are no indications in the report of unsatisfactory regions. As regards spring sowings, they began everywhere much sooner than usual. No diminution in the area under grain seems to have taken place.

According to a report from Consul Medhurst, dated 25th April, the winter sowings are coming up well in the Kuban and Stavropol districts of the Caucasus. The spring sowings, which promised to be equally good, required rain badly. In the Don country and parts of the Ekaterinoslav district, personally visited, both spring and winter sowings looked promising, slight rains having fallen quite recently. From portions of the Don and Northern Caucasus reports are to hand stating that no rain has fallen since the 31st March, and that it is feared everything will be dried up.

Germany.—According to the official report on the condition of crops in the middle of April, the average condition of both winter wheat and winter rye was 2·6 (very good = 1, good = 2, medium = 3). The winter crops came through the winter relatively well. The cold wet weather in March and the frequent night frosts had an unfavourable effect, but a general improvement in condition was clearly visible after the warm weather in April. Spring cultivation, which was somewhat retarded by rough weather in March, was quickly got through in April.

The Board of Agriculture and Fisheries have addressed a circular letter to Agricultural Societies and Chambers of Agriculture in Great Britain, in which they state that their attention has from time to time been drawn to the fact that in certain districts there has been a marked increase of rooks during recent years, and that the tillage area being now more restricted than formerly, the depredations of these birds have become more serious. It is alleged that in some districts the young rooks are not shot systematically, or that the rook-rifle rather than the shot-gun is used, and that, in consequence, a larger proportion of the birds escape.

While it is generally recognised that the work of the rook is to a large extent beneficial, it cannot be denied that at certain times of the year, and in the case of certain crops, the bird is capable of causing a serious amount of injury. Various suggestions have been made with the view to limiting the number of rooks, but the Board believe that, in the first instance, Agricultural Societies might with advantage approach the owners of rookeries in their districts, asking that at the proper season energetic action may be taken to keep the birds within reasonable limits. The Board have no reason to doubt that such an appeal would meet with a ready and cordial response.

Where tomatoes are attacked by "Sleepy Disease" (*Fusarium lycopersici*, Sacc.), it is recommended that the soil in which the plants grow should be removed and sterilized.

Sterilizing Soil.

The best and most certain method of sterilizing soil is to place it in a heap on naked ground, and not allow a weed of any kind to grow on it. When making the heap, place the soil in tiers about one foot thick; cover each tier with a layer one inch thick of equal parts of kainit and quicklime. The heap should be turned and dressed as directed three times during the year. The heap should be kept moist, as this induces the resting-spores to germinate, and it is only when germinating that they can be destroyed. Quicklime will not destroy resting-spores. Its use is to kill the mycelium produced by germinating resting-spores.

All manure used should be mixed with kainit, otherwise the sterilizing of the soil will be labour in vain. Soil treated as directed above can be used after one year's rest.

Spreading infected soil in a field where vegetation of any kind exists does not tend to stamp out the disease. The tomato is not the only kind of plant on which the fungus can grow, and various weeds present in such a locality would enable the parasite to reproduce itself for an indefinite period of time.

In certain parts of Scotland considerable attention is given to the production of lambs for the early summer market. Those farmers who make a practice of this have warm pens for the ewes and lambs, and give the ewes very liberal rations, and the lambs are fed on grain and cake as soon as they will eat. The lambs are dropped during the latter part of January and February, and are forced until May or June, when they are marketed. The ewes are given from $1\frac{1}{2}$ to 2 lb. of clover hay each per day, from 12 to 16 lb. of turnips, and from 1 to $1\frac{3}{4}$ lb. of a mixture of wheat-bran, crushed oats, and linseed cake; the larger allowances are fed to those with twin lambs. The lambs are fed in creeps, and are given all they will eat of oatmeal or rolled oats at first, and later on crushed oats, broken maize, and either linseed or cottonseed cake. Lambs at four weeks old will eat about an eighth of a pound each day, while at three months they will take from two-thirds to one pound each. When fed in this manner they make very rapid growth, and are always well fleshed.

**Fattening
Lambs.***

Fattening Hill and Mountain Ewes and Lambs.—When hill and mountain ewes are bought to be bred to a mutton sire for one crop of lambs, they are bred to drop their lambs in March and during pregnancy are given the run of grass or stubble land, with some turnips, so as to be in fair condition at lambing time. A few weeks previous to lambing they are fed on oats and linseed cake, or brewers' grains and linseed cake. From lambing time they are fed well until marketed, the lambs having

* From a bulletin by Professor W. J. Kennedy, published by the U.S. Dept. of Agric. Bureau of Animal Industry (No. 77).

the same food as soon as they are old enough to eat it. Grain and cake are given until grass is good, but after that time cake alone is fed, the amount varying from one-third to three-fourths of a pound per lamb per day, and from three-fourths of a pound to one and a quarter pounds per ewe per day. The lambs are marketed when from three to four months old, and, if ready, the ewes go at the same time, but generally they require about another four weeks liberal feeding on cake to finish them.

Fattening Lambs for Market.—Lambs for autumn and winter feeding are usually purchased in the month of September, or, if home-bred, are weaned at that time. They are first given the run of the stubble land for a few weeks, and are gradually taught to eat turnips, and later are folded on the turnip land. In addition they are fed on cut hay and a liberal allowance of grain and cake. When the lambs are on turnips, many successful feeders give cotton cake and dried brewers' grains, equal parts by weight, to the extent of from one-half to three-fourths of a pound per day. Should the roots be changed to swedes the grain ration is altered to two parts linseed cake, one part cottonseed cake, and one part dried brewers' grains. Swedes are thought to be more difficult to digest than common turnips, and the addition of linseed cake is supposed to assist digestion. The grain allowance is increased during the finishing period, and may be changed to eliminate the brewers' grains, but cake is practically always used as a part of the ration. Some farmers do not put their lambs on the turnip land so soon, but first graze them for two or three months.

An interesting feature of the Chicago Live Stock Exhibition was the competitive judging of live stock by students of the Agricultural Colleges. Two prizes were

**Value of
Live Stock Shows
to Students.**

given by the exhibition authorities, and batches of five students each from seven Colleges, took part in the competition.

After arranging the animals in order of merit, the boys were required to appear singly before the judges, and give their reasons for the order in which they had placed the animals. The trophy for horse-judging, previously held by the students

of Iowa College, was won on this occasion by Ohio; and the one for cattle, sheep, and swine, held by Ohio, went to the Ontario College. The Ohio students led in cattle and horse-judging, Texas in swine, and Ontario in sheep. The latter, however, scored the largest combined number of points in judging cattle, sheep, and swine, with Iowa second. In a maize-judging competition Iowa won a bronze trophy previously held by the Kansas Agricultural College.

The *Experiment Station Record* observes that the spirit of good-natured rivalry, which this competition engenders, is a healthy one, and serves as a stimulus both to students and instructors. The opportunity to measure swords with another institution is helpful to the boys and to those responsible for their instruction. The experience of taking part in such a contest is valuable, helping to develop confidence, self-reliance, and decision. Properly managed, the students' judging contest becomes an attractive and valuable feature of the show, and, incidentally, it attracts attention to the Colleges and to the practical nature of their work.

This annual Exhibition, which is the largest Live Stock Show in the United States, is visited by numbers of students from Agricultural Colleges. Seventeen States and the Province of Ontario were represented in 1905. There were about a hundred students each from Illinois, Iowa, and Nebraska, large numbers from the Colleges nearer by, like Wisconsin, Michigan, Indiana, and Ohio, thirty from Colorado, ten from Texas, several from Kansas, Missouri, and Louisiana, and eighteen from Ontario. Great advantage is taken of the educational facilities afforded by the collection of choice specimens of the different breeds of live stock, and the students not only watch the judging in the ring, but go round the Show under the guidance of an instructor and have the points of the animals explained to them.

The Agricultural Colleges and Experiment Stations also send stock for exhibition, there being no less than 275 entries by them in ninety-five different classes, largely in the fat stock, sheep, and swine classes, although there were several in the breeding classes and among the horses. Six Colleges also showed in the dressed carcase classes. The grand championship of the fat stock show was won by the Iowa State College with an Angus

steer, selected by Professor C. F. Curtiss about a year previously from a truck load at the stockyards, and fed at the College. The reserve champion was also from this College. This is the fourth year that the grand championship has fallen to a College or Station animal. The champion steer among the Shorthorns was from Purdue University, and Ohio State University took a large number of prizes for swine, including the championship in several classes.

The success which has attended the exhibition of stock by these Institutions has given rise to some complaint as to the competition of bodies supported or assisted by public funds with private exhibitors. This objection, however, does not seem to have met with much support, and in discussing the question the *Experiment Station Record* points out that, as a matter of fact, the champions for the past four years have been purchased in the open market at market prices, or by auction, and any advantage which the Colleges may have had has been in the direction of ability and not of funds. In feeding the animals no secrecy is observed. The conditions are a matter of careful record, and the results are, therefore, a contribution to the practice of feeding.

Their success in open competition with the best breeders has had a great influence in popularizing agricultural education, and has produced a striking change in the attitude of the American farmer towards these institutions. Of the list of judges at the Show, nine were men connected with the Colleges, and they judged in nearly 150 classes. Their work was repeatedly commended for the soundness of judgment displayed, and it was evident that they and the College instructors and authorities generally had secured the farmers' respect and confidence.

Anthrax is a contagious disease caused by a microbe, *Bacillus anthracis*. Human beings and all animals are liable to

Anthrax. become infected. The disease, which shows itself suddenly, occurs chiefly in cattle, pigs, and sheep, but is not uncommon in horses. It is very quickly fatal, usually within forty-eight hours, but in the United Kingdom it does not often spread with rapidity to animal after

animal, though it may affect a number of swine at the same time if they have been fed on flesh affected with anthrax.

Symptoms.—A beast, which a short time before appeared to be well, is found dead or in a dying condition; frequently blood oozes from the nostrils and the anus. In cattle there are no typical symptoms, but in horses and pigs the region of the throat is often found to be swollen.

Post-mortem appearances of the Disease.—The carcase is swollen. Blood is often found around the nostrils and anus. The muscles may be infiltrated with blood at certain points. The lungs and glands are congested. The spleen is very much enlarged; it is softer and darker than normal, and its substance usually resembles tar.

In most parts of this country the enlargement of the spleen in cattle is of great diagnostic importance, but in those districts where Red-water exists, enlargement of the spleen may also be due to this disease. In this case, however, the spleen substance has not the same fluid tarry appearance. The flesh is dangerous to animals and human beings.

Difficulty of recognizing the Disease.—One of the greatest difficulties which present themselves in dealing with this disease is that the symptoms during life are not such as to lead a person who is unacquainted with anthrax to suspect its nature or character. Moreover, the death of the animal attacked often occurs when the owner or attendant is absent. It frequently happens that an animal which has sickened is killed, or the carcase of an animal dead of anthrax is cut up, and the blood, which is the main source of danger, is freely spilt about the premises or on the soil. The disease is in this indirect manner spread to other animals, and in some cases the persons who have handled the carcase contract the disease. In every case of sudden and unaccountable death amongst stock the owner of the animal should await a skilled opinion before disposing of the carcase.

Anthrax or Suspected Anthrax to be Reported.—Every person having or having had in his possession or under his charge an animal affected with or suspected of anthrax is required by law to give notice of the fact with all practicable speed to the police. Failure to give such notice renders a person liable to a fine of

£20, and in certain circumstances to a month's imprisonment with hard labour.

It is the duty of the local authority on receiving such notice to institute inquiries, and to make proper provision for the disposal of the carcase of any animal suspected of anthrax, and for the disinfection of the premises upon which the disease has existed.

Precautions to be taken pending Inquiry.—Pending such inquiry the owner can do much to assist in preventing the spread of the disease amongst his stock, and it is clearly to his own interests that he should do so.

The sick animal should on no account be killed but should be carefully isolated from all other animals. Should it die before the arrival of the veterinary inspector the carcase must not be dragged along the ground, but should be allowed to remain where it is, until the examination has taken place. It is essential that the carcase of the animal should not be cut or opened, and steps should be taken to prevent the escape of blood or of excretions which may contain blood. Precautions should also be adopted to prevent the possibility of any person or animal obtaining access to the carcase or to any blood which may have exuded therefrom. As an additional precaution quicklime may be freely spread on the floor or on the ground surrounding the carcase. Animals with which the suspected animal has been in association should be carefully watched, and isolation at once adopted in the case of any animal showing symptoms similar to those of the suspected animal.

Procedure of the Local Authority.—The local authority is required by Article 3 of the Anthrax Order of 1899 to obtain the assistance and advice of a veterinary inspector in all instances in which anthrax is reported to them. Although the clinical symptoms may in many instances justify a veterinary inspector in forming the opinion that anthrax exists, it is desirable that his diagnosis should be supported by the positive evidence of a microscopical examination of the blood of the suspected animal. Such examination, if the specimen be obtained soon after death, is by no means difficult. The specimens should be taken in duplicate and carefully preserved for future reference.

Investigations as to the origin of the outbreak should include

careful enquiries as to the use for or about the animals of manufactured feeding stuffs or bone or other artificial manures, as such substances are known in some cases to have been the media by which the disease has been introduced. The possibility of infection being conveyed by the water which the animals drink should not be overlooked.

So soon as it has been decided that the disease is anthrax, or where the veterinary inspector is not in a position to certify that anthrax is not present, the owner should cause all cattle, sheep or swine which have been in association with the diseased or suspected animals, and are pronounced by the veterinary inspector to be apparently healthy, to be removed from the shed, or field or place where the disease has originated to some other place on the farm or premises where they can be isolated and kept under observation. The period of incubation of anthrax is very short, and seven days will as a rule suffice to enable the veterinary inspector to determine whether any of these animals have become infected or not.

Disposal of the Carcase.—Special attention should be given to the disposal of the carcase of an animal dead of anthrax. Cremation upon the spot where it died is, where possible, the safest method of disposal. Information on this subject has been issued by the Board. If it is necessary that the carcase be moved to some convenient spot for the purpose of cremation, the nostrils and all the natural openings should be carefully plugged with hay or tow saturated with a strong solution of carbolic acid in order to prevent the oozing of any blood therefrom. The dragging of the carcase along the ground is to be avoided. Where burial is resorted to the grave should be dug in some part of the farm remote from any water-course and to which animals cannot or do not ordinarily have access, such as a wood or enclosure. The method of burial is prescribed in the Anthrax Order.

The disinfection of the place or premises where a diseased animal has been detained or has died is then to be carried out in the most thorough manner of which circumstances will admit. All manure, or broken fodder remaining thereon should be disinfected or destroyed by fire.

General Observations.—It is important that it should be widely

known that anthrax is due solely to the introduction into the blood of an animal or of man of the minute germs of anthrax or their spores. The disease may therefore be introduced by any medium capable of conveying these germs or spores. Feeding stuffs brought on to a farm, or manures made from animal substances, may be vehicles of infection. If a stream becomes contaminated, as has been found to be the case where certain industries involving the use of the hides, hair, &c., of animals are carried on, the spores may be carried to the farm by the water. The spores of anthrax develop into bacilli which find their way into the circulation of an animal through a cut or abrasion.

Where infection has once been introduced upon a farm it has frequently been kept up by the ignorance or carelessness of individuals, and in some cases farms have become permanently infected with anthrax.

It is a common practice amongst owners of stock to slaughter their cattle as soon as they present symptoms of serious illness in order that the carcase and hide may be utilized. Where, as is not uncommonly the case, the sudden illness is due to the presence of anthrax, the greatest mischief is done by such a practice. The blood of the diseased animal is distributed on the ground, or it may be on the floors of the cattle shed or upon the mangers, or is carried on the boots of the attendants to other parts of the farm or premises. The bacilli contained within the blood of a diseased animal will, when exposed to the air, multiply with rapidity and produce spores which may become the means of infecting other animals at short or long intervals. Many cases have come under the notice of the Board from time to time of persons having contracted anthrax whilst engaged in slaughtering animals, or in dressing or otherwise handling the carcases of animals. From the beginning of July to the end of December, 1904, as many as twelve persons are known to have contracted the disease whilst so employed, six of whom died, whilst in one case amputation of the arm became necessary. Since 1904 similar cases have been reported to the Board involving deaths.

On the other hand the bacilli of anthrax die *if kept within the intact carcase* of an infected animal; no spores are

formed ; and experience has shown that where the precautions recommended above have been scrupulously adhered to the disease frequently ceases after the death of one animal on the farm.

Stockowners are, therefore, earnestly invited to co-operate with the public authorities,

- (a) By reporting every case of sudden and unexplained illness or death, especially amongst cattle, to the police ;
- (b) By isolating the ailing animal, or by protecting the carcass from persons or animals pending the arrival of the veterinary inspector ;
- (c) By giving every facility to the officers of the public authorities in carrying out the precautionary measures enjoined by the Anthrax Order ; and
- (d) By affording such officers every assistance in their power in tracing the origin of the outbreak.

They are further strongly recommended to give positive orders to their servants that *under no circumstances is an ailing beast to be killed by them, or its carcass opened* where the cause of sickness or death is unexplained.

The Board have prepared a short notice (A ³⁵⁷/_A) dealing with the principal points above set out, suitable for posting up in byres or sheds. Copies can be obtained gratis and post free from the Board.

The Danish Parliament has recently passed an Act which provides that certain imported agricultural produce must be marked, on the packing or on the article itself, so as to indicate whether it is of foreign or colonial (West Indian) origin. The products in question include butter, cheese, eggs, lard, tallow, honey, meat, horse-flesh, cattle, sheep, swine and poultry. When such imported goods are sold or re-exported they must be marked so as to indicate clearly that they are not Danish ; and, in this connection, the use of Danish place-names on the packing is forbidden. Premises where the produce, with the exception of cheese and honey, is sold, must exhibit in a conspicuous place a signboard which contains a definite "notice" that the goods have been imported. The sale of mixtures of Danish and

**Marking of
Agricultural
Produce in
Denmark.**

foreign lard is forbidden, unless the article is provided with a distinct mark which indicates that it is a mixture of this kind. Special regulations will be made as regards foreign butter in hermetically sealed tins; and with reference to various other matters.

The Act provides for the adoption of an official mark for butter manufactured in Denmark from pasteurized cream. The mark will apply to all exported Danish butter, with the exception of butter in air-tight tins, provided they are suitably marked as containing Danish produce. An analogous mark will be adopted for slightly-salted Danish pork which is exported. The importation and sale, &c., of foreign butter bearing any mark which might be mistaken for the official one will be prohibited. It is forbidden without permission to manufacture or import reproductions of the prescribed marks, or the material necessary for their production.

Wholesale and retail dealers and exporters of foreign butter are required to keep it in the original labelled packing, and a conspicuous "notice" must also be placed on all butter which is sold retail. If foreign butter is not delivered to the purchaser in the original packing, the wrapper which is put directly round the butter must be distinctly marked "Foreign butter."

Persons who trade in the above-mentioned goods, including manufacturers of butter from pasteurized cream in Denmark, must give notice in writing to the authorities by whom an official register of the dealers will be kept. The Customs authorities, the police, and the margarine inspectors shall have the right to enter premises where goods are offered for sale, to examine books, and to take samples on payment. Various penalties may be imposed for offences under the Act, and it will come into force after six months' notice in the Danish official gazette.

This destructive parasite (*Armillaria mellea*, Vahl.), also known as Collar Rot or *Agaricus melleus*, is one of the most abundant and widely distributed of British "toadstools." In addition to attacking nearly all kinds of orchard and other broad-leaved trees, it is parasitic upon European and some introduced conifers. The fungus, in common with many other kinds,

**Tree Root
Rot.**

grows in dense clusters round the roots of living trees, also round dead stumps. In some instances it appears to grow directly from the ground, but careful examination in such cases shows that the mycelium springs from buried wood, roots, &c. It is distinguished by the dingy honey-yellow coloured cap being covered, more especially towards the centre, with small, darker scales; the stem is coloured like the cap and has a frill or ring near the top; when young this frill extends from the stem to the edge of the cap and conceals the gills, which are whitish. Myriads of spores are produced, which form a snow-white powder on whatever they fall. These spores are distributed by wind, game, mice, &c., and aid greatly but not solely in spreading the disease.

Usually the first indication of disease is the drooping and yellowing of the foliage. When the symptom manifests itself, the presence of a thin, firm, white sheet of mycelium, situated between the bark and the wood at the collar, or on the main root-branches, clearly indicates *A. mellea* as the cause of the mischief. This felted white mycelium often extends up the trunk between the bark and the wood for several feet, and changes gradually into blackish cord-like strands of mycelium, called rhizomorphs, which continue to grow upwards between the wood and the bark as the latter becomes dry and separates from the wood. These cord-like rhizomorphs become variously branched, and anastomose to form an irregular black network, so frequently met with on removing the bark from a dead trunk, indicating the cause of its death. Black rhizomorphs may also be found surrounding the root-branches. In fact these first infect the tree by penetrating the bark of the root and giving origin to the white mycelium.

Preventive Measures.—When the leaves of a tree droop and turn yellow owing to the presence of the fungus, curative measures are hopeless, as the mycelium has by this time completely girdled the trunk. Nevertheless, it is very important at this period to adopt measures against an extension of the disease. When a tree has been killed the black rhizomorphs surrounding its root extend in all directions about three or four inches below the surface of the ground in search of living roots. When such are encountered, the tips of the rhizomorphs pierce

the bark and give origin to the white mycelium, which eventually kills the tree. These underground rhizomorphs travel for an unlimited distance in the ground, and, unless checked, con-



I.—CLUSTER OF *ARMILLARIA MELLEA*. II.—RHIZOMORPHS ON ROOT.

stitute a continual source of danger to trees surrounding the one attacked.

When a tree is attacked a portion of the bark at the collar should be removed, and if the white mycelium is found to have

passed up the trunk the case is hopeless, and the wisest course is to cut down the tree, remove as much as possible of the root, which should be burned, and not used for ornamenting some other portion of the garden, as is too frequently the case. When this is done, dense masses of toadstools appear in due course, and the underground rhizomorphs spread on every side. If the mycelium has not entered the trunk, but is confined to certain branches of the root, these should be removed, as much as possible of the root exposed, and covered with a mixture of equal quantities of quicklime and powdered sulphur. This mixture should also be placed round the base of the trunk before the soil is filled in.

Whether a diseased tree has been removed, or treated in the hope of recovery, a trench about eight inches deep and six inches wide should be made all round the site of the tree, at a distance well outside the spread of the branches. The object of the trench is to intercept the spreading rhizomorphs. If in a situation where an open trench can be allowed to remain, this is all that is required to be done. If in a place where an open trench would be objectionable, planks about six inches deep, well coated with gas-tar, may be let into the ground. In making the trench it is important that the soil removed be spread over the ground enclosed by the trench.

When the toadstool appears at the base of a trunk, it should be collected and buried; crushing it underfoot is worse than useless, as it only aids in the dispersal of the spores.

Great care should be taken not to injure the base of the trunk or exposed roots, as the spores can only enter the tree through a wound. The grass-cutting machine is responsible for many wounds through which this and various other fungi parasitic on trees first gain an entrance.

At the last meeting of the German Forestry Association (September, 1905), Oberforstrat Thaler and Forstrat von Peckle-

**Resistance of
Young Trees to
Drought.**

sheim gave an account of observations on the effects of the great drought of 1904 on trees planted in the previous season. In the districts under observation (Saxony and Hesse), scarcely any rain fell from the middle of April till

the end of August. Conifers, except the Scots Pine, were found to suffer more than hardwoods; the Weymouth pine, larch, and Norway spruce were most affected, while *Ailanthus glandulosa* and Scots Pine suffered least.

It was only below an altitude of some 1,300 feet that damage was done; at high elevations good growth was recorded. Some interesting facts are available as to the influence of the season of planting. Conifers planted late in autumn suffered more than those got in early, while scarcely a tree survived that was put in late in spring. The conifers which suffered least were those planted early in the spring season, that is, about February. Sowing was even less successful than planting. Keeping the surface of the ground open and clear of weeds by the use of the hoe was found to give good results. Side shelter from an adjoining wood was always beneficial, and the same was true with regard to considerable overhead canopy. Curiously enough, the effect of standards scattered thinly over the ground was distinctly bad.

Drought and heat are, of course, most injurious on south slopes, and to guard against their prejudicial effects the following points should be observed:—(1) Regenerate under considerable overhead canopy; (2) Where clear felling is practised take down the wood in narrow bands running from north-east to south-west; (3) Preserve bushes naturally present: these will shade the young plants to some extent; (4) Avoid opening up the wood by too early thinning; (5) In thinning retain all underwood capable of growth.—(*Zeit. für Forst- und Jagdwesen*, March, 1906.)

It is not infrequently noticed that when a wood of Scots Pines, partly on land that has never been under the plough and partly on old arable land, reaches the age of twenty to thirty years, the trees under the latter conditions become unhealthy, and subsequently begin to die off. In the early years of the life of the wood the trees growing on the land originally arable were probably the more vigorous, but in the

middle or latter half of the rotation they are apt to develop unsatisfactory symptoms. The kind of soil appears to make no difference, the evil being found on dry sand as well as on good loam. The disease seems to start at certain points and to spread outwards. Scots pines alone are affected, all other trees being apparently immune.

The direct cause of the trouble has been traced to the attack of two root-fungi, *Polyporus annosus* and *Agaricus melleus*, (or *Armillaria mellea*, see p. 111), the latter appearing subsequently to the former and completing its work. Although these parasites are not unknown on other trees they are chiefly met with on pines.

The subject is discussed by Forstmeister Frömbling in the March issue of the *Zeit. für Forst- und Jagdwesen*, who advances the theory that trees growing on old tillage land, being more "forced" in youth, have comparatively little power of resistance to attack. The fungi, too, find very favourable conditions of growth on old arable land, the residues of farmyard manure and the open texture of the soil favouring their development. Frömbling suggests that where it is intended to afforest arable land the following points should be observed:—(1) Avoid using Scots pines; (2) Avoid using farmyard manure for some years before planting; (3) Exhaust the soil by growing two or three corn crops in succession.

The Board have received from British representatives abroad some particulars relating to agricultural shows held in certain European countries.

Agricultural Shows in South-Eastern Europe.

The two principal agricultural shows held in South Russia are those of Rostov-on-Don and Elizavetgrad. An account of the former was given in a previous number of this *Journal* (March, 1906, p. 760). At Elizavetgrad there is an annual show in the autumn, but this will not be held in 1906. There is also a small annual show at Kharkoff for breeding cattle. Numerous horse shows are held in various parts of Russia under the auspices of the Imperial Stud Department of St. Petersburg. Detailed information as to shows in Russia can be obtained

from the Exhibition Department of the Ministry of Agriculture and of State Domains, St. Petersburg. Dealers in agricultural machinery who wish to exhibit anything take advantage of the principal fairs, where there is usually a small section for this purpose. The Ministry of Agriculture have sanctioned 106 shows of different kinds to be held during the present year, but it is reported to be uncertain how many of them will take place.

In Hungary it is not usual to hold annual agricultural shows at the same place. Shows are, as a rule, held only at intervals and in different places. They are arranged partly by the National Agricultural Association and partly by the respective County Agricultural Societies, and are of a national or provincial character. A description of one of these shows appeared in the *Journal* for December, 1902, Vol. IX., p. 355. During the current year the Agricultural Society of the County of Bihar intends to hold an agricultural show at Nagyvarad (Grosswardein).

In Bulgaria also agricultural shows appear to be held in different places, the objects exhibited being limited to the products of the district, such as cereals, honey, &c., but not including machinery. The show this year will be held at Plevna.

The only agricultural show of any importance held in Roumania during the last few years was that at Bucharest in 1904; it was, however, of purely local interest, and was supported entirely by private initiative. The only agricultural show that will be held in Roumania in 1906 will be the Jubilee Exhibition at Bucharest in June next, of which particulars have already been given in the *Journal* (Vol. XII., January, 1906, p. 362, and March, 1906, p. 760).

In Servia agricultural shows are said to be practically unknown. A small show is held at Belgrade in the autumn (about September), but the exhibits last year consisted merely of fruit, grain, and poultry, together with a few corn-mowing machines. This is believed by the British Vice-Consul at Belgrade to be the only show held in Servia, and it is quite unimportant and purely local.

The establishment of agricultural loan societies for the purpose of granting advances on land dates from the year 1850, and the methods then adopted have undergone but little change. The law of the 20th June, 1850, legalizing their formation, authorized the issue by them of bearer bonds exempt from stamp duty. Loans to borrowers are given not in cash but in these bonds, and it rests with them to obtain the best price they can for them in the open market. These bonds, which bear a fixed interest, are repurchased from time to time by the societies out of the repayments made by the borrowers, and it is to be noted that the amounts of the bonds and of the debt due on the mortgages always balance one another. The management consequently is very simple, as it chiefly consists in acting as an intermediary between the borrowers who repay their loans and the creditors who receive their interest. The rate of interest was at one time 4 per cent., but in 1895 it was reduced to $3\frac{1}{2}$ per cent., with one-half per cent. added for repayment of capital, which is usually extended over sixty years. The amount of the advance varies from 50 to 60 per cent. of the total value of the holding.

In 1880 the creation of two societies was authorized especially for the benefit of small cultivators. The amount of each loan was limited to £220, afterwards extended to £330, and the payment of the interest on the bonds of these societies is guaranteed by the State, which also granted a subvention towards the cost of their foundation.

According to a return in the Danish Statistical Year-Book for 1905, these various societies (nineteen in all) had granted 156,576 mortgages on which loans to the amount of £61,600,000 were outstanding.

Societies for the purpose of obtaining advances on personal security also exist in Denmark, but they are based on a somewhat different principle to the German and other Continental credit societies. They owe their foundation to a law (26th March, 1898) which authorized the advance out of State funds of

* See also articles on "Agricultural Credit Banks," May, 1905, p. 96; "Agricultural Credit in France," June, 1905, p. 149; "Village Banks in England," June, 1905, p. 154; "Agricultural Credit in Hungary," July, 1905, p. 210; "Agricultural Credit in Belgium," August, 1905, p. 279; "Agricultural Credit in Germany," March, 1906, p. 725.

£278,000 in loans bearing 3 per cent. interest. The object of the societies participating in these advances must be exclusively to make temporary advances to their members of capital required to cover the current expenses of farming. The total amount which a member can borrow is dependent on the normal number of cattle which his farm can support, a calculation made by the council of the society on the admission of each member. Members on joining pay 1 krone (about 1s. 1½d.) per head of cattle to the reserve fund. The sum to be borrowed by any member may not exceed 56s. per head of cattle, or £167 in all. The loan must be repaid in nine months, and no fresh loan will as a rule be granted within a month after repayment of the previous one. The money is lent upon a simple bond, each of the members being liable for the debts of the society. The rate of interest must be the same for all members and may not exceed 4½ per cent. per annum. Any profit during the year goes to the reserve fund; and any loss is defrayed by the members according to their borrowing capacity, up to 6¾d. per head of cattle, any further deficiency being met out of the reserve fund.

Such loan societies can borrow from the State a capital not exceeding 33s. 4d. per head of cattle at 3 per cent. per annum. The total number of members of any society are not to represent less than 1,000 head of cattle, and they are to limit their operations to a defined district. Permission is, however, given where necessary for the formation of societies representing fewer cattle than this.

Most of the societies are closely connected with the co-operative dairies in the sense that members of the latter only are admitted in many cases. The total number of societies in 1905 was 168, who shared the whole of the sum advanced by the Government.

The formation of mutual agricultural insurance societies has made very rapid progress in France during the past seven years.

Up to 1898 there were about 1,400 of these associations in existence, of which some 700 alone were in the Department of Landes, where the mutual insurance of cattle had long existed

Mutual Insurance in France.*

* An account of the system of cattle insurance in France was given in this *Journal*, Dec., 1904, Vol. XI., p. 547.

in a somewhat rudimentary form. In that year, however, the French Government included in the Budget of the Department of Agriculture a sum of £20,000 out of which small amounts (not less than £20) are granted, usually to assist in the foundation of new societies by the payment of preliminary expenses, &c., or, in the case of established societies, to help tide them over any exceptional losses which they may have incurred. According to a return recently issued by the French Minister of Agriculture, it appears that there were on 15th March, 1906, 6,556 mutual insurance societies, having 376,000 members, the capital insured amounting to nearly £21,000,000. Of this number, 5,993 are for the insurance of cattle, 495 for insurance against fire (agricultural risks), 28 against hail, 4 against accidents, and 36 are re-insurance societies. The total grants have amounted to £157,000. Cattle insurance societies are by far the most numerous, and this is explained by the fact that the risks are smaller and less dangerous than in the case of insurance against fire, hail, or accidents. The value of the cattle insured was £13,520,000 belonging to 324,000 members. For several years the efforts of the administration have been directed to the grouping of small local societies into unions or federations, with a view to the diminution of risks, and to enable them to sustain exceptional losses. Re-insurance societies now exist in 25 departments, representing 1,719 affiliated societies, and about £3,500,000 value insured.

Insurance against fire is undertaken by 495 societies having 18,074 members, the value insured being about £6,400,000. Most of these societies are federated in three unions.

Agricultural Exhibition at Antwerp.—An exhibition will be held at Antwerp from July 7—16 next, and some of the sections will be open to international exhibitors,

**Miscellaneous
Notes.**

viz.: Poultry appliances, &c., agricultural machinery and implements, including horticulture and dairying; manures, seeds, feeding stuffs, insecticides, &c.; improvement of sandy, marshy and uncultivated soils; horticultural appliances, packages, &c., and educational facilities.

A copy of the programme can be seen at the offices of the Board, 4, Whitehall Place, S.W.

State Aid to Horse Breeding in Victoria.—The Canadian Commercial Agent at Melbourne (Mr. D. H. Ross) reports that, with a view of increasing the export of horses to India, the State Government of Victoria has made a monetary grant for improving the breed of horses. The money will be expended in importing a number of pure-bred Welsh pony stallions and brood mares in order to form the nucleus of a pedigree stud for this breed. It is proposed to lease some of these ponies to persons in various districts throughout the State, on the recommendation of agricultural societies, on condition that their services will be made available at a moderate fee. It has been decided for the present year to restrict the expenditure of the grant to Welsh ponies, on account of the fact that there is urgent need of introducing new blood of this strain into Victoria.

Market for Seeds, Plants and Bulbs in South Africa.—The Canadian Commercial Agent at Cape Town (Mr. C. M. Kittson) reports a market for seeds in South Africa.

The following figures show the value of the imports of seeds into South Africa during the years 1903 and 1904, the latest years for which the details are available :—

	1903.	1904.
	£	£
Bird seed... ..	8,784	11,617
Garden and vegetable seeds	28,788	25,208
Potato seed (estimated)... ..	44,286	28,384
Plants and bulbs	10,973	14,203
Cereals (estimated)	95,000	85,000

Mr. Kittson states that the chief desiderata in catering for this trade are that seeds should not be forced, and that they should be well but economically packed in bulk, not in packets. —(*Board of Trade Journal*, March 8th, 1906.)

ADDITIONS TO THE LIBRARY DURING APRIL.

Germany—

- Mayr, H.*—Fremdländische Wald- und Parkbäume für Europa. (62 pp. + xx. plates.) 1906.
Scherer, R.—Das Kasein.
Passon, M.—Die Praxis Agrikultur-chemikers. (295 pp. + v. plates.) 1905.
Hollrung, Dr. M.—Der Rübenbau. (174 pp.) 1906.
Hoffman, Dr. M.—Die Kalisalze. (61 pp.) 1905.
Neumann, Dr. C.—Das deutsche landwirtschaftliche Genossenschaftswesen. (82 pp.) 1903.
Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft. 115 :—Die Zwergzikade und ihre Bekämpfung. (49 pp.)
Steuert, Dr. L.—Das Buch vom gesunden und kranken Haustier. (467 pp.) 1904.

Great Britain—

- University of Leeds.*—Bull. 54 :—Garforth Calf-Rearing Experiments, 1899-1903.
Edinburgh and East of Scotland College of Agriculture.—Report on Experiments with Varieties of Swedes, 1902-1905. (15 pp.)
Highland and Agricultural Society of Scotland.—Transactions, 1906. (442 + 90 pp.)
Gilchrist, D. A.—Why Potatoes Vary in Cropping Power. (17 pp.) [A record of results at Cockle Park.]
Armstrong College, Newcastle-on-Tyne.—Bull. 4 :—Effects of Manures throughout Rotations of Crops at Six Centres in Cumberland, Durham, and Northumberland. (52 pp.)
Royal Agricultural Society of England.—Journal. Vol. 66. (266 + clviii. pp.)
Royal English Arboricultural Society.—Transactions. Vol. VI., Part II. (343 pp.) 1905-6.
Royal Scottish Arboricultural Society.—Transactions. Vol. XIX., Part I. (244 pp.)
University College, Reading.—Report of Field Trials and Experiments, 1905. (22 pp.) 1906.
Morris, G. Ll., and Wood, Esther.—The Country Cottage. (152 pp.) 1906.

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- Bombay Presidency.*—Department of Land Records, Report for 1903-4. (22 pp.) 1905.
North-West Frontier Province.—Report on the Administration of Land Revenue, Department of Land Records and Agriculture, for 1904-5. (35 + liii. pp.) 1906.
Bengal.—Report of the Agricultural Branch of the Department of Land Records and Agriculture for 1904-5.

United States—

- Department of Agriculture.*—Annual Reports for 1904-5. (569 pp.)
Bureau of Entomology:—
 Circ. 69. Some Insects Affecting the Production of Red Clover Seed. (9 pp.) 1906.
 Circ. 70. The Hessian Fly. (16 pp.) 1906.
 Circ. 71. House Flies. (9 pp.) 1906.
 Circ. 73. The Plum Curculio. (10 pp.) 1906.
Farmers' Bulletins:—
 No. 243. Fungicides and Their Use in Preventing Diseases of Fruits. (32 pp.) 1906.
 No. 245. Renovation of Worn-out Soils. (16 pp.) 1906.
 No. 247. The Control of the Codling Moth and Apple Scab. (21 pp.) 1906.
 No. 248. The Lawn. (20 pp.) 1906.
 No. 250. The Prevention of Stinking Smut of Wheat and Loose Smut of Oats. (16 pp.) 1906.
 No. 251. Experiment Station Work, xxxiv. (32 pp.) 1906.
 No. 253. The Germination of Seed Corn. (16 pp.) 1906.
Bureau of Plant Industry:—
 Bull. 93. The Control of Apple Bitter-Rot. (33 pp. + viii. plates.)
 Bull. 100, Part III. Garlicky Wheat. (14 pp. + ii. plates.)
New Jersey State Agricultural Experiment Station.—Report for 1904-5. (689 pp.) 1906.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of April, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 7	7 5	36 6	33 6
Herefords	7 8	7 1	—	—
Shorthorns	7 6	6 11	35 8	32 10
Devons	7 11	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	9	8	8½	6¾
Sheep :—				
Downs	8¾	8	—	—
Longwools	8	7½	—	—
Cheviots	10	9½	10	8½
Blackfaced	9½	8½	9½	8½
Cross-breds	8¾	8	10	9
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	7 2	6 9	7 1	6 2
Porkers	7 7	7 2	7 7	6 8
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 6	17 3	21 8	17 4
„ —Calvers	19 14	17 1	19 17	16 12
Other breeds—In Milk ...	18 5	14 10	18 15	15 7
„ —Calvers	13 6	10 16	18 7	15 2
Calves for Rearing	2 1	1 12	2 11	1 17
Store Cattle :—				
Shorthorns—Yearlings ...	8 12	7 8	9 9	7 16
„ Two-year-olds	12 15	11 7	14 10	13 0
„ Three-year-olds	16 4	14 7	15 16	15 2
Polled Scots—Two-year-olds	—	—	16 13	13 6
Herefords— „	15 12	14 3	—	—
Devons— „	12 17	11 16	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	49 9	43 9	—	—
Scotch Cross-breds	—	—	40 1	35 1
Store Pigs :—				
Under 4 months	30 4	23 0	27 1	21 0

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of April, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	49 6	50 0	51 6	—	52 6*	50 0*
	2nd	47 6	45 6	46 6	42 0	51 6*	45 6*
Cow and Bull ...	1st	—	43 6	42 6	38 6	44 6	39 6
	2nd	—	38 0	38 0	36 0	35 0	35 0
U.S.A. and Cana- dian:—							
Birkenhead killed	1st	48 6	48 0	47 0	48 0	46 6	—
	2nd	45 0	45 0	45 0	45 0	45 6	—
Argentine Frozen—							
Hind Quarters ...	1st	28 0	30 6	32 0	31 0	32 6	29 6
Fore „ ...	1st	23 6	23 6	23 6	23 6	24 6	23 6
Argentine Chilled—							
Hind Quarters ...	1st	34 6	36 6	36 0	34 6	—	36 6
Fore „ ...	1st	26 0	26 6	27 6	26 0	—	27 0
American Chilled—							
Hind Quarters ...	1st	47 6	48 6	48 0	47 0	49 6	49 6
Fore „ ...	1st	32 0	34 0	33 0	32 6	35 0	35 6
VEAL:—							
British	1st	68 6	70 0	75 0	80 6	—	—
	2nd	64 0	58 6	69 6	75 0	—	—
Foreign	1st	69 0	—	71 0	72 6	—	67 0
MUTTON:—							
Scotch	1st	78 0	—	81 0	78 6	77 0	72 6
	2nd	69 6	—	76 0	73 6	69 6	62 6
English	1st	70 6	69 6	76 6	71 0	—	—
	2nd	63 6	61 0	69 0	66 6	—	—
U.S.A. and Cana- dian:—							
Birkenhead killed	1st	—	67 6	71 0	70 0	70 0	—
Argentine Frozen ...	1st	32 0	36 0	36 6	35 0	35 6	36 6
Australian „ ...	1st	29 0	32 0	34 0	32 6	35 0	33 6
New Zealand „ ...	1st	41 0	39 6	41 6	40 0	—	—
LAMB:—							
British	1st	106 0	95 6	101 6	101 0	—	—
	2nd	91 0	84 0	94 6	93 6	—	—
New Zealand ...	1st	49 0	49 6	50 0	49 6	56 0	55 6
Australian ...	1st	36 6	40 6	38 6	38 6	42 0	41 0
Argentine ...	1st	36 6	41 0	39 6	39 6	—	41 0
PORK:—							
British	1st	69 0	66 6	63 0	63 0	58 0	58 6
	2nd	63 6	56 6	57 6	57 6	56 0	50 6
Foreign	1st	64 6	59 0	60 0	60 0	—	51 6

* Scotch.

AVERAGE PRICES of British Corn per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (in 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12	27	1	30	8			19	10	24	10			16	6	18	3		
" 19	26	9	30	10			20	4	24	8			16	7	18	5		
" 26	26	9	30	11			19	8	24	4			16	7	18	8		
June 2	26	10	31	3			18	8	23	6			16	8	19	1		
" 9	26	6	31	4			18	5	24	0			16	10	18	11		
" 16	26	5	31	7			18	2	26	0			16	8	19	1		
" 23	26	5	31	7			19	2	23	9			16	10	18	10		
" 30	26	4	31	8			18	8	23	2			17	1	19	7		
July 7	26	6	32	1			19	8	22	11			17	1	19	6		
" 14	26	10	32	3			18	9	23	10			17	6	19	7		
" 21	27	7	32	2			18	10	23	7			17	6	18	11		
" 28	28	0	32	3			19	9	23	11			17	10	19	3		
Aug. 4	28	3	31	11			19	9	22	0			17	10	18	4		
" 11	28	4	30	5			19	9	22	5			17	7	16	11		
" 18	28	8	28	5			22	5	23	4			16	7	16	4		
" 25	29	5	27	1			23	2	23	6			16	5	15	9		
Sept. 1	30	2	26	11			25	3	23	5			16	3	15	9		
" 8	30	0	27	1			24	10	23	4			16	1	15	11		
" 15	29	7	26	11			24	9	23	7			15	11	16	0		
" 22	29	10	26	8			25	10	23	10			15	9	15	11		
" 29	29	10	26	9			25	5	24	3			15	8	16	1		
Oct. 6	30	2	26	9			25	6	24	9			15	9	16	3		
" 13	30	5	26	11			25	4	24	10			15	8	16	6		
" 20	30	4	27	1			25	5	25	0			15	11	16	7		
" 27	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3	30	6	27	10			25	0	24	9			16	0	17	1		
" 10	30	3	28	3			24	6	24	10			15	11	17	4		
" 17	30	2	28	7			24	5	24	6			16	0	17	8		
" 24	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1	30	4	28	8			24	6	24	6			16	2	17	11		
" 8	30	4	28	6			24	4	24	7			16	2	17	11		
" 15	30	4	28	5			24	4	24	5			16	2	17	11		
" 22	30	3	28	4			24	7	24	6			16	1	17	11		
" 29	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and Breslau.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: February ...	39 11	40 0	23 8	25 1	18 10	22 1
March ...	39 10	39 10	24 0	25 2	19 4	22 3
Paris: February ...	40 3	40 4	24 4	25 2	19 9	22 8
Belgium: February ...	30 0	30 11	23 5	24 4	19 10	21 9
March ...	30 10	30 3	23 8	24 6	20 6	21 5
Berlin: February ...	38 6	39 1	—	—	20 2	22 9
March ...	37 11	38 3	—	—	19 11	22 9
Breslau: February ...	36 1	35 3	26 5	25 1	19 10	20 8
March ...	{ 35 7	35 2	26 5	27 9 (brewing) 19 7 (other)	19 10	20 7

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of April, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	31 2	29 8	23 1	23 0	18 3	20 0
Norwich ...	31 2	28 11	24 4	23 7	16 8	18 3
Peterborough ...	30 2	28 9	23 4	23 5	17 1	19 1
Lincoln ...	29 9	29 0	22 9	23 10	16 7	18 11
Doncaster ...	29 0	28 3	24 6	23 9	16 5	18 11
Salisbury ...	30 5	29 3	23 2	24 8	17 7	18 8

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain
MARKETS in ENGLAND and SCOTLAND in the Month of
April, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
BUTTER :—								
British ...	13 3 per cwt.	11 9 per cwt.	— per cwt.	— per cwt.	— per cwt.	— per cwt.	14 0 per cwt.	— per cwt.
Irish ...	108 0	—	102 0	99 0	—	—	—	—
Danish ...	111 6	109 6	111 6	108 6	111 0	107 0	110 0	109 0
Russian ...	98 6	95 0	104 6	101 0	95 6	93 0	—	—
Australian ...	94 6	92 6	95 6	93 6	96 6	91 0	99 6	86 0
Argentine ...	102 0	98 0	99 0	97 6	96 0	93 0	100 0	—
CHEESE :—								
British, Cheddar	78 0	73 0	— 120 lb.	— 120 lb.	76 0 120 lb.	70 0 120 lb.	70 0	65 6
„ Cheshire	—	—	72 0 per cwt.	65 0 per cwt.	75 6 per cwt.	69 0 per cwt.	—	—
Canadian ...	68 0	66 0	67 6	63 6	67 6	63 0	68 0	64 0
BACON :—								
Irish ...	70 6	68 0	70 0	66 0	70 6	67 0	—	—
Canadian ...	64 0	63 6	65 0	62 0	61 6	56 6	64 0	60 0
HAMS :—								
Cumberland ...	106 0	98 0	—	—	—	—	—	—
Irish ...	105 0	98 0	—	—	—	—	97 0	91 0
American (long cut) ...	55 0	54 0	57 6	54 0	56 6	54 6	57 6	53 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	8 9	7 1	—	—	—	—	—	—
Irish	8 3	—	7 5	6 9	7 4	6 6	6 8	6 4
Danish	8 5	7 8	8 7	6 11	—	—	8 2	7 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	61 0	55 0	—	—	78 6	68 6	52 6	45 0
Scottish Triumph... ..	62 6	55 0	54 0	43 6	53 6	48 6	—	—
Up-to-Date ...	71 0	57 6	58 6	49 6	53 6	48 6	40 0	35 0
HAY :—								
Clover... ..	92 0	81 0	94 6	83 6	88 0	68 6	80 0	70 0
Meadow	77 6	68 0	83 6	81 6	—	—	77 6	67 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	126	67	361	222
Swine Slaughtered as diseased or exposed to infection ...	761	383	1,808	1,138
Anthrax:—				
Outbreaks	74	83	333	361
Animals attacked	143	117	504	517
Glanders (including Farcy):—				
Outbreaks	75	103	361	392
Animals attacked	159	151	678	719
Sheep-Scab:—				
Outbreaks	23	58	268	605

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	APRIL.		4 MONTHS ENDED APRIL.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	7	5	16	25
Swine Slaughtered as diseased or exposed to infection ...	46	113	260	309
Anthrax:—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy):—				
Outbreaks	—	—	2	9
Animals attacked	—	2	7	25
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	11	28	127	207

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THE INTERNATIONAL AGRICULTURAL INSTITUTE.

The International Agricultural Institute owes its inception to the initiative of His Majesty the King of Italy, who early in 1905 invited the different Governments of the world to take part in a Conference, to be held at Rome in the May following, for the purpose of considering the constitution and organization of the proposed Institute.

The objects which the King of Italy had in view in suggesting the creation of this new body may be gathered from the following extract from a letter which His Majesty addressed to the President of the Italian Council of Ministers:—

“The agricultural classes, who are generally the most numerous, and who exercise great influence everywhere on the fate of nations, are unable, owing to the area over which they are scattered, to take adequate measures either for the improvement of their produce and for its distribution in accordance with the demands of the consumers, or for the protection of their own interests in the market, which is becoming more and more world-wide, for the more important products of the soil.

“In these circumstances an International Bureau would be of the greatest assistance, a Bureau, which, devoid of any political object, would aim at studying the conditions of agriculture in the various countries of the world, and would notify periodically the quantity and the quality of the crops, in such a

way that production would be aided, transport rendered cheaper and quicker, and a more convenient basis established for the determination of prices. This Bureau, acting in accordance with the various departments of State concerned with agriculture, would also furnish precise information on the condition of the labour market in different places, so that emigrants would have a useful and reliable guide; would promote agreements for the common protection against those diseases of plants and cattle which measures undertaken locally are unable to cope with successfully; and in the last place would encourage, when the opportunity offered, the development of rural co-operation, assurance, and agricultural credit.

"The beneficial effects of a Bureau of this kind, which, as a bond of solidarity between all agriculturists, would be a weighty element in favour of peace, would be far-reaching. Rome would be a worthy seat for the Bureau, where the representatives of the adherent States and of the principal agricultural associations would meet, and harmonize the authority of the Government with the free energy of the cultivator of the soil."

The Conference for the further consideration of the proposal was formally opened at Rome on the 28th of May, 1905, forty different States being represented. The following gentlemen acted as delegates of Great Britain, viz.:—His Excellency the Right Hon. Sir E. Egerton, G.C.M.G., K.C.B.; the Right Hon. the Earl of Jersey, G.C.B., G.C.M.G.; the Right Hon. the Earl of Minto, G.C.M.G.; Sir Thomas Elliott, K.C.B.; T. P. Gill, Esq.; while Sir Edward Buck, K.C.S.I., represented the interests of the Government of India.

The programme of matters to be considered by the Conference comprised:—

1. Constitution and organization of the International Institute of Agriculture.

2. Functions of the Institute.

(a) To notify periodically information concerning agricultural produce, conditions of labour, diseases of plants and cattle.

(b) To facilitate from the international point of view the organization and movement of rural co-operation, insurance, and agricultural credit.

(c) To propose, on its own initiative or on the invitation of

Governments, international measures and institutions for the protection of the interests common to the agriculturists of all countries, taking into consideration also the views expressed by the International Congresses of Agriculture.

(*d*) To exercise the other functions which already form the object of the large agricultural associations, and with which the Institute could deal independently of the action of different Governments.

3. Financial resources of the Institute.

These subjects were discussed and reported upon by committees and sub-committees of the delegates, and their conclusions were embodied in an "Acte Final," which it was arranged should be submitted by the Italian Government for the consideration of the various Powers.

According to this document the International Agricultural Institute is to be an official institution, in which each country adhering shall be represented by delegates of its own selection.

Whilst limiting its action to international questions it is to be the duty of the Institute :—

(*a*) To collect, elaborate, and publish, with as little delay as possible, statistical, technical, or economic information regarding the cultivation of the soil, its production, whether animal or vegetable, the trade in agricultural products, and the prices obtained on the various markets.

(*b*) To send to interested parties, in a similarly rapid manner, full information of the nature above-mentioned.

(*c*) To indicate the wages of rural labour.

(*d*) To notify all new diseases of plants which may appear in any part of the world, indicating the districts affected, the spread of the disease, and, if possible, the efficacious means of resistance.

(*e*) To consider questions relating to agricultural co-operation, insurance, and credit, in all their forms, collecting and publishing information which may be useful in the various countries for the organization of undertakings relating to agricultural co-operation, insurance, and credit.

(*f*) To present, if expedient, to the Governments, for their approval, measures for the protection of the common interests of agriculturists and for the improvement of their condition

after having previously taken every means of obtaining the necessary information, *e.g.*, resolutions passed by International Congresses or other Congresses relating to agriculture or to sciences applied to agriculture, Agricultural Societies, Academies, Learned Societies, &c.

All questions relating to the economic interests, the legislation and administration of any particular State are to be excluded from the sphere of the Institute.

The States adhering to the Institute will be classified into five groups, according to the place which each State considers best to select.

The number of votes at the disposal of each State, and the number of units of subscription, are fixed according to a scale by which the units of subscription may vary from one to sixteen and the votes from one to five. In any case the contribution corresponding to each unit of subscription can never exceed the sum of 2,500 francs (£100). As a temporary measure, the subscription for the first two years will not exceed the sum of 1,500 francs (£60) for each unit.

In order to assist by his personal help towards the foundation and maintenance of the Institute, His Majesty the King of Italy was pleased to present to the Institute the control and the revenues of two domains in the environs of Pisa, estimated to produce an annual income of some 300,000 francs (£12,000). Pending the legal constitution of the Institute, this magnificent benefaction has been assigned to a Royal Commission as from the 1st of July, 1905, and it has been decided to devote the income accruing from that date to the construction of a house to form the seat of the Institute.

The new building, which will be constructed in the grounds of the Villa Umberto I., in the neighbourhood of the Pincian Gate, on an area of 10,000 square metres of State property, will in all probability be completed towards the end of 1907.

The British delegates, in their report on the proceedings of the Conference, after describing the steps which led up to the conclusions embodied in the "Acte Final," make the following general observations on the purposes which it is hoped the International Institute will not unworthily fulfil:—

"It will be apparent from a perusal of the 'Acte Final' of

the Conference that the proposed Institute will in effect constitute an International Agricultural Intelligence Department for the collection, collation and publication of technical, economic, and statistical information of interest to agriculturists, special prominence being given to the questions of co-operation, insurance, and credit. It is true that provision is also made for the submission to the various Governments of proposals for the protection of interests common to agriculturists, and for the improvement of their condition ; but in view of the stipulation that questions touching the economic interests, the legislation and the administration of individual States shall be specifically excluded from the competence of the Institute, and that the subjects to be discussed by the General Assembly of the Institute are to be such as are approved by the adhering Governments, it would appear that the difficulties and dangers which might attend the extension of the work of the Institute in this direction are sufficiently guarded against.

“ Several of the leading agricultural departments already endeavour, so far as is practicable, to collect and publish information as to agricultural production, prices and wages in the various countries of the world, and the value of such information is universally recognised. The extent to which it is obtained, the methods of collection and of publication, differ, however, very materially, and it may be expected that the establishment of the Institute will lead to a considerable extension of the area from which full information is obtained and to greater uniformity as regards the manner of its collection and presentation.

“ It was fully recognised that the utmost promptitude must be secured if information of the character in question is to realize its full value, and that free use must be made of telegraphic agencies for this purpose.

“ The Institute will, moreover, afford to agricultural departments, to the various agricultural societies, and to private individuals alike, a much more ready means of obtaining information as to comparative agricultural conditions in a form which will enable it to be safely and conveniently used than is at present available. The difficulties attending the use of technical and statistical information, given in foreign official publications,

or obtained as the result of special enquiry, are well known, and it will be of distinct advantage that an international body should be available for reference, charged with the duty of sifting and collating such information for the assistance of those concerned.

"The publications of the Bureau should become invaluable to students and writers on agricultural subjects and to the officers of the various agricultural departments and societies. Those officers, with the assistance of agricultural newspapers and of the Press generally, may be trusted so to utilize and make known the work of the Institute as to render it of the greatest possible practical value to the cultivator.

"The expenditure of the Institute will to a material extent be met out of the resources so graciously placed at its disposal by His Majesty the King of Italy. The balance of the charge remaining to be borne by the various adhering Powers will be comparatively small, especially if the proposals receive the unanimous support of the States represented at the Conference, and if those States take a liberal view of their requirements as regards the choice of the group in which they will propose to be included. The maximum expenditure of a State adhering to the Institute as a member of Group I. will be, as we have already stated, £960 during each of the first two years of its existence, and £1,600 subsequently. We have no hesitation in expressing the hope that the necessary provision will be made to enable the United Kingdom to take its share in the work of the Institute, and we believe that the resulting benefits will be fully commensurate with the outlay proposed."

The Lords Commissioners of His Majesty's Treasury have agreed to the adherence of this country to the Convention for the establishment of the Institute and the signature of His Majesty's representative at Rome was accordingly affixed on the 27th February, 1906.

The Correspondence on the subject, together with the Report of the British Delegates and the Minutes of Proceedings at the International Conference, have been published as a Parliamentary Paper. [Cd. 2958. Price 1s. 7d.]

LOUPING-ILL AND BRAXY.

The Departmental Committee appointed by the President of the Board of Agriculture in 1901 to enquire into the ætiology, pathology, and morbid anatomy, and other matters connected with the diseases of sheep known as Louping-ill and Braxy, has now presented its report. The members of the Committee were Professor D. J. Hamilton, M.B., F.R.C.S.E., of Aberdeen University; Mr. J. McL. McCall, M.B., C.M., M.R.C.V.S., Assistant Veterinary Officer of the Board of Agriculture; and Mr. E. G. Wheler, of Alnwick. Mr. R. B. Greig, F.H.A.S., F.R.S.E., of Aberdeen University, acted as Secretary and Demonstrator, while Mr. J. McL. Young, F.R.C.V.S., Lecturer on Veterinary Hygiene, Aberdeen University, and Mr. A. H. Berry, F.R.C.V.S., Superintending Veterinary Inspector, Board of Agriculture, were also appointed to assist in the work of the Committee.

The report of the Committee, which contains results of very great scientific interest and also of much practical importance to sheep-owners, is published in three parts,* of which Part III. is a general summary of the investigations specially prepared for the use of flock-owners and farmers.

The general features of the two diseases are described as follows:—

Louping-ill.—This disease appears to be confined to the British Isles. It is very prevalent in the West and South of Scotland and the North of England. The mortality caused by louping-ill under normal conditions, although it may rise as high as 50 per cent., does not commonly exceed 20 per cent., even in the worst districts. If, however, sheep are moved from “clean” or healthy to “foul” or infected ground, it is well known that excessive mortality is likely to be the result. Sheep are subject to louping-ill at all ages, but more especially during their first year, and other animals, such as cattle, pigs, and even geese are occasionally attacked.

The disease takes two forms, chronic and acute. In the former, the sheep is usually convulsed at first, and afterwards more or less paralysed, lying sometimes for weeks unable to

* Part I., General Report [Cd. 2932], price 3d.; Part II., Details of Investigation [Cd. 2933], price 4s.; and Part III., Summary of Suggestions. [Cd. 2934], price 2d.

rise. The appetite may not fail entirely, and ultimate recovery, though very rare, is possible, but one or more of the limbs, it is said, may be permanently crippled, and the sheep may have to be killed in consequence. In acute cases the disease runs its course to a fatal issue in a few hours, with symptoms of blood-poisoning.

Braxy.—Braxy is found over a wide area of country. It is said to exist in Cornwall, and to a lesser extent in the West of England. It is more prevalent again in the South of Scotland, and is endemic throughout the most of the West Highlands, its area of greatest intensity. It is the most terrible scourge among sheep in this country, and at its chief centres, the West and South of Scotland, the death-rate is often 20 per cent. among the first year's sheep, and may at times amount to almost total annihilation.

The disease runs its course with remarkable rapidity, and, in fact, the first intimation is generally the finding of the dead animal. Putrefaction appears to set in immediately after death. Under natural conditions, therefore, opportunity is seldom afforded of studying its symptoms, but all accounts seem to agree in describing the first symptoms to be a short, quick step, followed by unsteady gait, and a tendency to lie down and get up suddenly.

Bacterial Origin of Louping-ill.—At the commencement of the investigation nothing was known of the cause of louping-ill, and the symptoms were so similar to several other diseases that it was next to impossible to distinguish them. After the examination of a very large number of cases, the existence of a specific bacillus in liquid found in the peritoneal cavity was ascertained, and the result of subsequent experiments definitely established the bacterial character of the disease.

Following this discovery, it was made out by a long series of experiments that the bacteria or their spores, which latter are almost indestructible by natural influences, are taken up by the mouth when feeding, and thus pass into the alimentary canal. Here they remain and multiply, being evacuated in quantities with the dejecta, but not necessarily injuring the animal.

A very remarkable discovery was subsequently made with regard to susceptibility and immunity. It was found that if the blood of a healthy sheep were placed in a test tube, a culture

of the louping-ill bacillus added to it, and the mixture incubated at the body temperature with exclusion of air, very opposite results were obtained at different seasons of the year. If this were done in the spring, during the louping-ill season, the organism, as a rule, grew freely upon the blood, while at other times of the year the converse usually took place—the blood destroyed the bacillus. A period was eventually reached, in July and August, when this bactericidal action of the blood became complete and invariable.

The same remarkable fact was found to apply to the bacteria of a number of allied diseases to which further reference will be made.

A clue to the whole nature and cause of the disease had now been obtained. During certain months of the year the louping-ill bacillus may apparently reside and multiply in the alimentary canal without occasioning any injury to the sheep. The wall of the stomach and of the intestine forms a complete barrier to its passage into the peritoneal cavity or into the tissues. This seems to be due to the blood exerting an influence inimical to its growth at these particular times. When the dangerous period, viz., the spring time, approaches, owing to the blood failing in its power to destroy the bacillus, this protective influence is lost, and the organism, if now picked up by the sheep for the first time, is able to pass the wall of the intestine with facility. If such be the case, the growth in the peritoneal liquid will be luxuriant, the liquid turbid from the multitude of bacteria present, and the sheep will die with symptoms of blood poisoning.

It can well be imagined, however, that there may be many cases where the power of the blood is not so completely lost, and that under such circumstances the invasion of the cavity would be much more gradual. A condition of chronic poisoning would then be established, the poison acting slowly on the nerve centres and paralysing them. This gives rise to the second kind of case, where the disease seems to run a chronic course, and where nervous symptoms are manifested. It is in this type of the disease that the peritoneal liquid is usually clear, and the bacilli so few as to be unrecognisable under the microscope until their numbers have multiplied by incubation.

- Those sheep which, when grazing, pick up the organism during the season when they are not susceptible (viz., when the blood can destroy it) usually allow of its passage along the intestine without detriment, and are evidently thus rendered immune, so that when the period of danger arrives they fail to take the disease.

On the other hand, sheep which pick up the organism for the first time during the dangerous period (viz., when the bacillus can grow upon the blood), have little power in resisting the passage of the organism into the peritoneal cavity, and, consequently, many of them fall victims to the disease.

This theory accounts (1) for the larger death-rate among lambs and hogs, (2) for the excessive mortality which occurs when sheep are brought from "clean" on to "foul" ground during the spring months.

It may be mentioned that there is no evidence to show that louping-ill is infectious in the sense of a fever. Very few, if any, sheep take it a second time; it is doubtful whether those which apparently do so have not previously suffered from some other complaint having symptoms more or less resembling those of louping-ill.

Braxy and Allied Diseases.—It had previously been suspected that various diseases passed under the name of braxy, and this proved not only to be the case, but, further, it was discovered that louping-ill, braxy, and several other diseases as yet only partially examined, form a most interesting and important group, closely allied, all acquired through the fodder, all caused by anaërobic bacteria, whose habitat is in the alimentary canal, and all of which are subject to the peculiar seasonal action of the blood described above under louping-ill. Referring to the group the report (Part II., p. 329) says: "The side issues that have cropped up show how little the diseases to which sheep are liable are understood—how much, in fact, they are misunderstood—and what necessity there is for more extended and trustworthy knowledge of their nature and cause. From a pathological point of view, they are a perfect mine of wealth, are fraught with scientific problems of the highest interest and importance, and are most suggestive of what may turn out to be a new light on the pathology of many of the

contagious and infectious diseases of man and of the lower animals."

The group in question is thought to comprise: Braxy or sickness, louping-ill, black-quarter, struck, malignant œdema; two diseases of doubtful identity distinguished as "A" and "B," and a peculiar disease of the deer.

The chief characteristics common to the members of the group are, so far as yet known, as follows:—

They occur at definite seasons of the year; they are more or less confined to certain farms or districts; the carcasses have a strong typical odour; they are each caused by a specific anaërobic bacillus resident in the alimentary canal; the bacilli in the whole of them are destroyed by the blood of the sheep during the summer months, and to a less extent at other times of the year, but during the "season" peculiar to each they grow with more or less facility upon it; they may all probably be prevented by a method of drenching described below.

Preventive Treatment.—A long series of experiments was conducted to discover if louping-ill and braxy could be prevented by subcutaneous inoculation of their bacilli. This method of procuring immunity by injecting the culture under the skin, however, was found to be uncertain and unsatisfactory. The organism not being introduced into the intestine—its natural habitat—but inoculated subcutaneously, often produced results which were violent and sometimes ended in the death of the animal. At times this method failed entirely to confer immunity, and, whether successful or not, it enfeebled the sheep, causing uneasiness, lameness, and loss of condition.

The natural habitat of this group of bacteria being the intestine, and the fact of the diseases due to them being acquired by feeding, suggested the idea of "drenching" or introducing the organism by the mouth in preference to the method of subcutaneous inoculation. The results have proved eminently satisfactory. No pain, uneasiness, or loss of condition has been noticed, and in every way the new method has proved successful. These results were arrived at gradually. There were numerous failures, largely owing to ignorance of the seasonal variation of the blood, which was discovered only in 1904. The extraordinary success of the subsequent preventive measures

proves the importance of the discovery. Great danger may be incurred by preventive treatment at the wrong time of year, as the animal being then in a susceptible condition, the disease may be communicated and death ensue.

The drench which proved so effective was prepared by incubating the specific bacteria on glucose-beef-tea, a small quantity of which mixed with water was administered to each sheep by the mouth, a second dose being given a week to a fortnight later.

The drenching experiments were confined to braxy and louping-ill, but there is no reason to anticipate that successful results will not be obtained by a similar method of treating the other diseases of the same group.

The results of the experiments were as follows :—

Date.	Number of Sheep Treated.	Deaths.	Deaths from other Diseases.
<i>Treatment for Louping-ill.</i>			
June, 1903	10	<i>From</i> <i>Louping-ill.</i> None	None
March, 1904	175	2	2
December, 1904 }	1,340	1	26
January, 1905 }		(doubtful)	
<i>Treatment for Braxy.</i>			
Autumn, 1903	34	<i>From Braxy.</i> None	3
Autumn, 1904	1,545	9 (3 doubtful)	144

Some of these braxy experiments were carried out too late in the autumn, viz., in September, October, and November. It is, therefore, doubly surprising that the mortality from this disease was reduced to such a low figure. When it is considered that the sheep treated in both sets of experiments were on land notoriously foul, where in many cases a death-rate of 20 per cent. would be thought low under normal conditions, and that in some instances sheep were deliberately moved from "clean" to "foul" land to increase the severity of the test, the results both from louping-ill and braxy are satisfactory beyond anything that could have been reasonably expected. There seems, in fact, to be no reason why absolute immunity may not be secured against both diseases, provided proper precautions are taken. So far as has yet been ascertained, sheep so drenched are rendered permanently immune.

It is stated in Part II. (page 328) of the report :—The question “whether an animal may be immunized to several of these diseases at once is a matter of which we have little experience. The only experiment we made on the subject, and the only evidence we possess relative to it, is with regard to louping-ill and braxy. To twenty-five sheep we administered a mixture of a culture of the braxy bacillus and that of louping-ill in the early autumn. The farm on which they were pastured claims a high mortality from both diseases, but, notwithstanding, not a single death occurred among them.”

The passage quoted continues :—“This subject of *multiple immunization* through the intestine opens up a field of research fraught with the most profound practical issues, and of which nothing at present is known. Indeed, the whole subject of immunizing through the intestine is one which has bearings of a far-reaching character relative not only to diseases of the lower animals but also to those which are peculiar to man.”

It may be well to state that while the manufacture of the cultures of the louping-ill and braxy bacilli must be left in scientific hands, the cost of preparing and the trouble of using them are but small details compared with the value of the lives which they promise to save.

Summary.—Braxy and louping-ill form two of a group of specific bacterial diseases.

There is some amount of similarity in the symptoms of certain of the diseases of this group.

This similarity frequently results in errors of identification.

The primary habitat of the bacteria which are their cause is, in the whole of them, the alimentary canal.

At certain seasons of the year the blood of the sheep is unable to resist the invasion of these bacteria, and death ensues.

At other seasons the blood of the sheep destroys these bacteria, and at such times the animal is proof against them.

The germs of this group of diseases are picked up by the animal when feeding.

The fatal effect of these germs in the case of louping-ill and braxy may be prevented by drenching with a culture of the respective bacilli during the period of resistance.

If the drenching be done at a wrong time of year, viz., during

a period of susceptibility, death may follow as a result in a certain number.

It has yet to be shown whether drenching methods will succeed with the other diseases of the group, but the evidence, so far as it goes, tends to show that not only is this the case, but that immunity may probably be secured against two or more of them at the same time.

REPORT ON RAILWAY RATES.

The Committee appointed on April 22nd, 1904, by the Board of Agriculture and Fisheries, "To inquire as to the rates charged by railway companies in Great Britain in respect of the carriage of foreign and colonial farm, dairy, and market garden produce from the ports of shipment, or of arrival, to the principal urban centres, and to report whether there is any evidence to show that preferential treatment is accorded to such produce as compared with home produce, and if so what further steps should be taken either by legislation or otherwise to secure the better enforcement of the law in the matter" have now presented their report.*

The Committee, after reviewing the evidence, proceed to discuss the meaning to be attached to the expression "preferential treatment" used in the reference. The view of some of their number was that their investigations should be limited to discovering whether there is or is not *prima-facie* preference accorded to foreign and colonial as compared with home produce under the existing system of the conveyance of agricultural produce, and to offering suggestions for remedying such conditions if they found them to exist.

Dealing with this view first, the Committee recognise that inasmuch as lower or so-called preferential rates and greater facilities are accorded to produce, whether home or foreign, presented in certain volume with certain regularity and in certain shape, and in so far as produce so presented is almost entirely foreign and colonial, these lower or preferential rates and greater facilities do in practice constitute preference or advantage to foreign and colonial produce. *A* is a port, *C* is a market, *B* is

* Report [Cd. 2959], price 5d. ; Minutes of Evidence [Cd. 2960], price 2s, 11d.

an agricultural station half-way between *A* and *C*. There are in use rates under which the local trader at *B* sees foreign and colonial produce in large quantities conveyed from *A* to *C* on terms better than he can command for small quantities from *B* to *C*. From his point of view this is preference, and accounts for the wide-spread feeling of grievance which led to the appointment of this Committee.

This *prima-facie* preference is justified and explained by the railway companies on the grounds of the greater bulk, more constant and regular supply, and better packing of the foreign and colonial consignments; of the lessened cost, therefore, of dealing with them, and also of the undeniable fact that, in many cases, the competition of water transit is so severe that, unless they have the rates which now prevail, this traffic would equally go to its destination, and would equally compete with home produce in the market, but that the profit of carrying it would go into hands other than theirs, and so their power of spending on the development of their business would be lessened, to the general detriment of the British public.

The Committee recognise the strength of the justification and explanation, and cordially admit the generous offers and efforts made by most of the great companies to stimulate local agricultural trading, offers and efforts which have met with but very scanty recognition. The local trader cannot expect for small, irregular, and often ill-packed consignments the same rates and facilities as are given to the large, regular, and well-packed consignments with which he is in competition, and, in order to claim comparatively equal rates and facilities, he must organize something like a reasonable approach to the conditions under which the competing trade is carried on.

At the same time the Committee consider that the circumstances and conditions of British agriculture entitle it to fair and generous treatment, and that, therefore, when any such reasonable approach is made, the trader should be, if he is not already, entitled to demand, as a right, such rates and facilities as would place him on a comparative equality with his foreign or colonial rival, and that as a dispute as to what was a reasonable approach might arise, and as it might be difficult for an ordinary trader to conduct his case personally, the Board of

Agriculture and Fisheries, when satisfied that the approach was reasonable, should act on behalf of the trader.

In the view of the majority of the Committee, the meaning to be attached to the term "preferential treatment" in the reference is that their investigations should be directed to ascertaining whether there is any preference beyond what is sanctioned by the existing law ; in other words, whether undue preference is accorded by the railway companies to foreign and colonial as compared with home produce.

Dealing with this view the Committee find that the evidence has not established the existence of any such undue preference.

The Committee describe the remedies already provided by Parliament for dealing with complaints between railway companies and traders, viz., the powers of the Board of Trade under the Conciliation Clause of the Railway and Canal Traffic Act of 1888 and the powers of the Railway and Canal Commission, and the Committee are not prepared to recommend that any "further steps should be taken, either by legislation or otherwise, to secure the better enforcement of the law in the matter," as the evidence shows that there has been a marked absence on the part of complainants to avail themselves of the existing remedies provided by legislation, and there is no proof that these remedies are inadequate for the purpose. When traders wish to press their complaints they, or the associations or bodies they represent, should do so by formally complaining to the Board of Trade under Section 31 of the Railway and Canal Traffic Act, 1888, or to the Railway and Canal Commission, before whom the details could be thoroughly threshed out. The Committee indicate in what respects they think the Board of Agriculture and Fisheries might render useful assistance in helping complainants to take advantage of the existing remedies ; and the Committee also suggest that the Board of Agriculture and Fisheries should issue circulars, from time to time, recommending producers to apply to the railway companies which carry their produce for the various rates at which the produce they may wish to send will be carried according to the method of packing and the size of the consignments.

Apart from these suggestions the Committee take the view that agriculturists should seek to improve their position in regard

to railway rates by co-operation. They point out that the most effective way in which the home producers can claim and can obtain lower rates is to combine and co-operate with the object of sending their produce in larger quantities and packed so as to give good loading in the trucks. The companies not only desire and are willing to give every assistance to bring about such co-operation, but some of them point to the special efforts which they have already made and are continuing to make in this direction, though hitherto their efforts have met with little success. Combination and co-operation on the Continent have, it is stated, been of great advantage in enabling the foreign produce to be imported into this country, but here it appears to be difficult to induce the farmers to co-operate.

The desirability of co-operation seems to be so generally recognised that it is to be regretted that its adoption should make so little progress, but some of the railway companies seem to think that the unwillingness of the farming industry to combine is gradually though slowly being overcome, and that better progress will be made in the future. The Committee are of opinion that co-operation affords a practical method of enabling farmers to meet foreign competition and to put themselves in a position to obtain lower railway rates for the conveyance of agricultural produce. Co-operation has the advantage over other suggestions that have been made of being a remedy which the railway companies have shown themselves ready to welcome and assist.

The majority report which is summarized above is signed by the Earl of Jersey, Sir James Lyle Mackay, Colonel Sir Herbert Jekyll, Sir C. J. Owens, Colonel W. S. Kenyon-Slaney, M.P., and Mr. J. F. S. Gooday. Mr. E. G. Haygarth Brown differed from his colleagues on the Committee as to the meaning of the term "preferential treatment," and presented his views in a separate report. The conclusions at which he arrived are as follows :—

1. Preferential treatment is in some cases accorded to foreign produce in the sense that rates are charged for such produce which are lower in proportion to the cost of the services rendered than the corresponding rates for home produce.
2. In existing circumstances agriculturists have no practical

means of ascertaining whether such preference exists in any particular case, and no practical means of testing the question whether such preferential treatment, if it exists, amounts to undue or illegal preference.

3. The Board of Agriculture and Fisheries should obtain, when requested, for the information of agriculturists, particulars of rates for imported traffic and the division of these rates into charges for sea and land traffic and for dock, harbour, shipping, and carting charges.

4. The Board of Agriculture and Fisheries, on complaint being made that a rate for home agricultural produce is higher in proportion to cost of carriage than a rate charged for the carriage of foreign produce of a similar kind, should enquire and consider whether there is *prima-facie* ground for such complaint.

5. The Board of Agriculture and Fisheries should, in any case where they think it desirable, advise and assist the agriculturists concerned to bring the matter before the Board of Trade.

6. The Board of Agriculture and Fisheries should, when they think it desirable, direct one of their officers, or such other person as they think fit, to attend before the Board of Trade to assist the agriculturists to state their case.

7. The Board of Agriculture and Fisheries should have power, subject to the sanction of the Treasury, to pay a part or the whole of any expenses incurred in connection with the bringing of such cases before the Board of Trade.

8. A report of the proceedings in such cases before the Board of Trade be laid before the Board of Agriculture and Fisheries, and that the Board of Agriculture and Fisheries should report annually to Parliament on all cases of alleged preferential treatment in connection with which they have rendered assistance to agriculturists.

9. In any case where it appears desirable in the interests of agriculture, the Board of Agriculture should approach the Board of Trade with regard to the appointment by the Board of Trade, under Section 6 of the Regulation of Railways Act of 1873, of a person to take proceedings before the Commissioners.

SAINFOIN SEED.

Sainfoin (*Onobrychis sativa*) has been known and cultivated as a fodder crop for over 200 years, having been introduced into this country about the middle of the seventeenth century from France, under the name of "Finger-grass"; the name "Sainfoin," by which it is commonly known, seems to be a corruption of "Saint-foin" or "holy hay." Sainfoin is a deep-rooting perennial plant indigenous to dry chalky soils, and is a member of that most valuable natural order of plants known as *Legumi-*

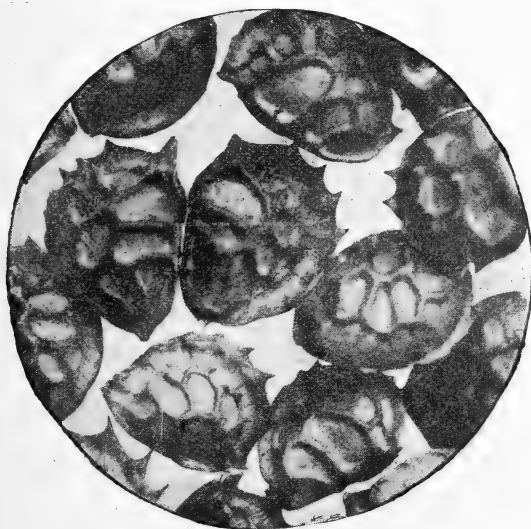


FIG. 1.—SAINFOIN SEED. (Magnified four diameters.)

nosæ. The agricultural importance and various characteristics of the seeds of the most important members of this family have been considered in recent issues of this *Journal*.^{*} On light soils, suitable to its growth, the primary root descends to a great depth, and, in consequence, the plant is able to withstand the severest drought and be, in a sense, independent both of surface moisture and manure. Although sainfoin has been found to succeed on any soil sufficiently dry, it is only on light, calcareous soils that the highest yields are obtained.

Grown under conditions where the surface soil is clean, in good heart, and the subsoil light and readily penetrated by the tap-

^{*} Red Clover, March, 1906 (p. 716); White and Alsike Clover, April, 1906 (p. 7); Lucerne and Trefoil, May, 1906 (p. 82).

root, sainfoin will persist and maintain its usefulness for a considerable time, the limit in this country being, perhaps, from four to seven years. It is sometimes sown instead of clover, more particularly in the Eastern Counties, and after two or three years it is ploughed up and the land afterwards laid down to corn.

Though sainfoin is scarcely ever sown on soils other than those of a calcareous nature, the farmer can, as a rule, reckon on a fairly successful crop, provided, as already indicated, that the mechanical condition of the subsoil—which is more impor-

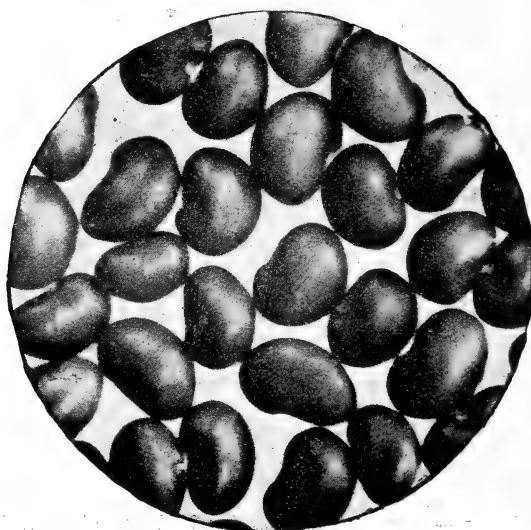


FIG. 2.—MILLED SAINFOIN. (Magnified four diameters.)

tant than the surface layer—is sufficiently porous to allow the roots to penetrate easily.

Sainfoin grows to a height of $1\frac{1}{2}$ to $2\frac{1}{2}$ ft., and produces numerous succulent branches with abundant foliage, bearing many flowered spike-like racemes of flesh colour or rosy red; the compound pinnate leaves, which have from six to twelve opposite pairs of oblong leaflets and an odd terminal one, are sufficiently distinctive to aid one in recognising the plant.

During the early stages of growth, continued drought affects sainfoin but little, while cold, wet surroundings and frost are injurious. As a general rule, the maximum yield is obtained the third year after sowing. There are two varieties in cul-

*Sainfoin**Seed Pod**Soft Brome Grass**Burnet**Soft Brome Grass
Back view*

SAINFOIN AND SEEDS COMMONLY FOUND IN SAMPLES OF SAINFOIN SEED.

(Seeds drawn to scale and magnified four diameters.)

tivation, the common sainfoin (*Onobrychis sativa*) and giant sainfoin (*Onobrychis sativa* var. *bifera*). These come into bloom during May and June, the common sainfoin flowering a little later than the giant variety. The common sainfoin is distinguished by its considerable aftermath, which consists of long leaves, flowering stems being absent. The giant sainfoin is of more rapid and heavy growth, the second cutting producing flowering stems, and in consequence of its being a double-cut plant it is not so lasting in character. On land that is not particularly suitable for growing a successful crop of sainfoin, the farmer would be well advised to sow the giant in preference to the common variety, as on land which is not able to hold the common sainfoin for the usual term of years, the giant variety will yield more bulky crops in the time, and may be cut more often.

It is important that the cutting for hay should start directly flowering commences, as the plant is then at its best for feeding purposes, and each day's delay injures both the quality of the hay and the future yield of the crop.

In the selection of sainfoin seed, as in the case of many other farm seeds, too little attention is given to the quality of the sample, the character of the stock from which it was grown, the variety to sow, and whether the common or giant sainfoin will be most economical and best enable the farmer to attain the object he has in view. In the purchase of seed for sowing purposes it is manifestly of prime importance that due attention be paid to the purity and vitality of the sample.

In outline, the single-seeded fruit of sainfoin is half-moon shape, round on one side, and somewhat straight on the other. Both sides are convex, with a coarse network of raised veins, provided in some instances with spiny projections (see Fig. 1). In good fresh samples the seed pods are fairly bright, and the colour is a dark straw, or a light reddish-brown. Very dark and dull looking seeds should be avoided, and also pale yellowish-green seeds, the former being the evidence of old age, the latter of immaturity. The milled seed (that is, the seed removed from the husk or pod) and the entire fruit are both used by the farmer, but perhaps the latter course, that of sowing the entire fruit, is most frequently followed, when it is sown at the rate of four bushels

per acre, while fifty to fifty-six pounds of the milled seed is allowed for the same area. The seed removed from the pod has a smooth surface, reniform or kidney-shaped in appearance (see Fig. 2), and in good samples it is plump and yellowish-grey or light brown in colour. When black or shrivelled it has either been spoilt by bad harvesting or old age, perhaps a combination of both evils. Seed of this character may sometimes be found when it is bought in pod (see Fig. 3).

To one accustomed to handle many samples a fair idea of the commercial value may be gained in the first instance by closely examining the seed pod or fruit; its weight in the hand, colour

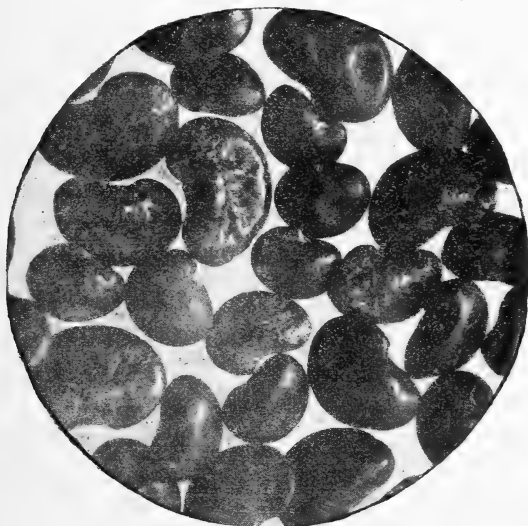


FIG. 3.—SHRIVELLED DARK-COLOURED SEED. (Magnified four diameters.)

and freshness in appearance, are indications of value. The true seed can be examined by removing the husk and observing the plumpness and colour of the seed. In this way experience may teach one in a degree to arrive at a fair and honest judgment. Nevertheless, it must be remembered that gauging the commercial value by the external features only is a matter of opinion in which experts may differ. It is only by the application of special tests that we are able definitely and truly to estimate the value of any sample of seed.

Assuming that the conditions are favourable to a healthy growth, the amount and quality of the resulting crop is, in a very great measure dependent upon the purity and vitality of

the seed sown. A fresh, living seed responds more quickly and vigorously to the germinating test than an old or weathered stale one, and it must be remembered that when the germination is prolonged and slow there is increased liability to disease—to the ravages of insects and fungoid pests—and the plant produced is weak, resulting in a poor crop at harvest time.

The most casual examination of sainfoin seed will enable one readily to understand that opportunities for its successful adulteration scarcely exist, and, so far as the writer's experience goes, it is never attempted, but accidental impurities are not uncommonly met with. (See illustration.) These are burnet

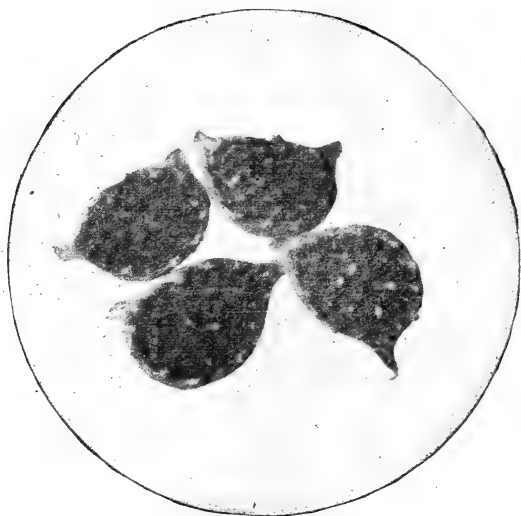


FIG. 4.—CORN CROW-FOOT. (Magnified four diameters.)

(*Poterium sanguisorba*) and soft brome grass (*Bromus mollis*). Other impurities are barren brome grass (*Bromus sterilis*), corn crow-foot (*Ranunculus arvensis*), and the black wrinkled pods of trefoil (*Medicago lupulina*).

As a rule, all the foreign seeds found in sainfoin (with the exception of burnet) can readily be removed by means of sifting and winnowing, and make but little waste. The removal of burnet is more difficult, and if present in any quantity it is well-nigh impossible to make the sample absolutely pure.

The seeds of burnet are in reality two-seeded fruits, and the difference in their shape and size compared with the seeds of sainfoin is well marked, both in the illustration and in the micro-

photographs, yet, owing to both being wrinkled and of the same colour, unless the sample is very closely scrutinized the burnet seeds may be readily overlooked.

The best way of insuring a practically pure seed—and, consequently, if other things are equal, a clean crop—is to purchase milled seed only, for, by the milling process, and the removal of the pod, should yield only the plump kidney-shaped seed as shown in Fig. 2. The burnet, if present, will be at once seen, as it cannot be milled, the only result of the milling being the bruised and broken-winged appendages of the seed. Milled seed can, as a rule, be purchased practically pure, and the un-



FIG. 5.—BURNET: A COMMON IMPURITY IN SAINFOIN.
(Magnified four diameters).

milled, or seed in the pod (though invariably containing *Bromus mollis* and a certain amount of mechanical impurities) can always be obtained having a purity of at least 98 per cent.

Owing to the sainfoin seed ripening somewhat irregularly, and the difficulty experienced in removing immature seeds without inordinate waste, the germination, when in the pod, is comparatively low, but there is no difficulty whatever in obtaining seeds showing a vitality varying from 75 to 85 per cent., and in milled seed 90 per cent. and over.

D. FINLAYSON.

The Board have received through the Foreign Office the following report by Mr. Vice-Consul Stevenson on the subject of the cultivation of asparagus in Brunswick.

**The Cultivation of
Asparagus in
Brunswick.**

The culture of asparagus in Brunswick has from the first proved very lucrative, and its importance has increased from year to year.

Seed.—In considering the various causes which have contributed to this success it may be well to commence with the seed, especial attention having been paid to it. It has been the custom, when cutting the asparagus in spring, to leave the strongest and thickest plants in the ground. With a view to making these stronger, all successive sprouts from the same root are cut away, so that the whole strength may be concentrated in the seed-bearing stalk. These stalks are then fastened to sticks, that they may not be damaged by strong winds. In case of drought they must be watered, and a dressing with liquid manure tends to a fuller development of the seed. When the plants are dead and yellow and exhibit red berries the seed is ripe, and it must then be gathered and cleaned after the removal of such seeds as are not fully developed.

Seedlings.—The seed must be sown in the month of March in well-manured soil, sandy rather than heavy. The beds are dug over at this time, because the ground then begins to be warmer and the young plants develop better than when the seed has been sown in the autumn.

The rows are about 20 in. apart, and the seeds are sown separately at a depth of $1\frac{1}{2}$ in. and $1\frac{1}{2}$ to 2 in. from each other, so that the young plants have plenty of space to develop. The ground is then made smooth with a rake and gently patted down. As soon as the plants appear above the ground great care must be taken to eradicate any weeds.

Choice of Soil.—A light sandy soil with a slightly loamy subsoil is most favourable for asparagus; a deep sandy soil is also not bad, but this requires plenty of good manure. In a soil consisting of sand and loam the plants mature later, so that the stalks should be cut much thicker.

A piece of ground sloping to the south is the best position for asparagus-beds. Where a soil is in other respects suitable but

has a damp subsoil, it must be drained, if possible, before the beds are made. Any trees should be removed as they absorb nourishment from the ground and the shade has a deterrent effect on the growth of the plants. Where weeds are rank and couch grass prevalent (the latter is especially injurious to asparagus), the making of the beds should be deferred till the ground has been thoroughly cleaned by the use of the plough and harrow. An interval must then be allowed, so that the soil may settle thoroughly.

Making of the Beds.—The best position for the beds is from north to south, if there is protection from the north winds; otherwise a position from east to west is preferable. The most suitable soil is one which during the last two years has been planted with potatoes, turnips or similar crops, and which can be kept free from weeds. After the final gathering of the previous crop, the land must be dressed with liquid manure, horse or cow dung, and ploughed over, harrowed and rolled before the winter. The beds should be made early in spring. Experience shows that rows should be planted singly, as the stalks grow thicker in this way, and prove very productive after three or four years. The beds should be three-fourths of a yard broad with a similar distance between them; they are to be made on the slant, so that they taper gradually. The best time for planting the beds is when the young plants begin to sprout at the beginning of the warm weather, from April to July. After carefully stubbing the roots, they should be sorted and the weakest thrown away. The main point is to select those only which have a few strong shoots, even though the roots may be weak. The roots must be planted 3 to 4 in. deep and about 2 ft. apart, so that they will not be likely to suffer from the drought, and the earth must be stamped down firmly, after which the beds must be raked thoroughly till smooth. When the weeds have died down in November, any remains must be dug down into the earth and a dressing of dung 4 in. thick put on the top.

The asparagus may be cut towards the end of April; in the cold weather once a day suffices; but in warm weather twice, in order that the asparagus may be fresh and white. The stalks must be cut off with a sharp knife, not pulled or broken off, as this is most injurious to the plants. The opinion that the

roots are damaged by cutting off the stalks is confuted by the fact that there are beds where this process has been pursued which still yield a plentiful supply after twenty-four and even thirty years.

For preserving, stalks from $9\frac{1}{2}$ in. long are most suitable. If longer it will be found that the lower end is hard and has not a good flavour. In the fourth and the fifth year the asparagus may be cut till 24th of June. When the weather has continued warm uninterruptedly the growing power is soon exhausted, and cutting must be stopped earlier. The main point is to see that the root and stalks develop fully, in order that in the next year these can again produce strong stalks. The beds should be systematically manured every year, at the rate of eight to ten loads of dung per acre. Where artificial manure is used, the land, before being dug in autumn, should be dressed with kainit at the rate of about 10 cwt. per acre. Where the land is poor a very advantageous manure is: 8 cwt. basic slag, 3 cwt. nitrate of soda, and 3 cwt. superphosphate, which can be dug in in spring. Asparagus thus cultivated is not only very fine in flavour, but has very thick stalks weighing from seven to ten per lb. Sometimes even two weigh 1 lb. Smaller plots can be subjected to an intenser cultivation than large fields, so that the yield of the former is incomparably greater. A case has been known where the asparagus from a plot of 200 square yards was sold for £15 in one season. Plants from the fifth to the eighth year prove most productive.

Storing and Packing.—As the value of asparagus is determined by its freshness and whiteness, care must be taken after cutting it to keep it in a dark place. In this way, when the weather is cool, its freshness and whiteness may be preserved for several days, but when the weather is warm it withers and looks blue or red after it has been cut twenty-four hours. To prevent this it should be buried in moist sand in some dark place or cellar or covered with a damp cloth.

In sending off large quantities, it should not be packed with moist grass or moss, as this might cause it to become too heated and thus be spoilt. It is best to pack it in a basket lined with paper covered over with a linen cloth. In this way quantities are exported to England, Sweden, and Russia without deteriorating.

When several days must elapse before they are unpacked, a reddish colour is inevitable: this part can be peeled off and when boiled the flavour is not impaired.

The Forcing of Asparagus.—Asparagus can be forced very easily, the results varying according to the state of the beds. Beds which produced thick stalks in the previous year are likely to continue to do so. A commencement may be made in November, fresh beds being started at intervals of three weeks, and in this way a constant supply can be ensured all through the winter. Eight days before commencing cutting the necessary horse dung must be placed in heaps, in order to keep it sufficiently warm. The plan followed is to have a stock of frames as broad as the beds, 7 to 8 in. high and about $2\frac{3}{4}$ to 3 ft. long, with a supply of boards with which to cover them. The soil surrounding these frames must be removed to the depth of 10 in., and replaced with manure which must be stamped down. Should there be intense cold or a fall of snow, one can throw leaf mould over to prevent a too sudden change of temperature. The stalks begin to appear in about a fortnight. As an even temperature is preserved in the frames, the plants continue to develop for a space of four weeks, during which time a good supply may be counted on. Near Brunswick, asparagus has been forced for some years in log huts closely constructed with double walls so as to retain the heat. These huts are movable on wheels. Along the paths which separate the huts hot-water pipes are laid, so that ample warmth is ensured.

Diseases.—The diseases to which asparagus is subject usually proceed from an irregular development due to sudden changes of temperature or unusual climatic vicissitudes, against which one cannot always make provision. An early hard frost is most injurious, as it destroys the cells so that they cannot discharge their functions properly, and causes premature decay before the nutritive qualities are imparted to the root stock. A similar cause of damage are the fungi so prevalent in dry seasons, which prove very destructive in the case of undeveloped plants. The first signs of the approach of this disease are reddish spots on the stalks which gradually extend to a great size. A continuance of this disease for several seasons weakens the plants

so much that the produce is only fit for making soup. It has been observed that the blight is most prevalent where the soil is sandy and poor, so that manuring the soil well may be regarded as a preventive measure.

Animals which Harm Asparagus.—Among quadrupeds the black field rat is the most destructive. This animal is about twice the size of a field mouse. Where they have once settled it is most difficult to exterminate them.

Moles also do harm by raising the earth, but the older plants are not affected in this way. Of insects, the larva of the asparagus beetle is most to be dreaded.* A good method of catching the beetles is to place cups under the plants, on shaking which the insects fall off; they are otherwise difficult to find after falling from the plant.

Expense of Growing Asparagus in Brunswick.—The initial expenses, *i.e.*, the cost of making beds and maintaining them in the first and second years, are given below, and from this estimate it will be seen that if we suppose the beds to last fifteen years, the average cost per acre per year would amount to 25s. 4d. :—

	£	s.	d.
Rent for two years, per acre	4	10	0
Lime for the ground	0	6	0
Ten loads of dung at 4s. 6d. per load, including haulage	2	5	0
4,500 asparagus plants, 10s. per 1,000	2	5	0
Initial cost of preparing and making the beds	3	0	0
6 cwt. artificial manure in autumn of first and second year	1	7	0
Carting of same and digging	1	0	0
Work in second year	0	15	0
Two years' weeding and cleaning	0	4	0
Other work, hoeing, &c.	2	0	0
4 cwt. artificial manure in second year	0	18	0
Miscellaneous	0	10	0
	£19	0	0

Yearly Expenses after the Second Year.

	£	s.	d.
Making and maintaining the beds	1	7	0
Rent	2	5	0
Artificial manure for dressing	0	18	0
Work in autumn, cleaning, hoeing, and weeding	0	8	0
Work in spring, digging	1	5	0
Wages for cutting the asparagus	6	10	0
Miscellaneous	0	10	0
	£13	3	0

* See the Board's Leaflet No. 47.

Yearly Profits.

	£	s.	d.
13 cwt. of heads at 36s.	23	8	0
Deduct expenses	13	3	0
Net profit per year... ..	£10	5	0

Dr. Stolle, of Proskau, has made a computation as to the results obtained in 1896, in good ground, from twenty-five plants of the following sorts :—

Gelber Burgunder	28½ lb.
Connovers Colossal	24¾ „
Erfurter Riesenaspargus	23¾ „
Ruhm von Braunschweig	21½ „

Calculating 4,500 plants per acre and multiplying the above results by 180, one obtains a yield of about 40 cwt. per acre. This shows, of course, an unusual success. On an average in good seasons, one may reckon on 17 to 20 cwt. per acre, but in poor years the yield is not more than half this. Results chiefly depend on the condition of the ground, the weather, the variety of plants, and the care bestowed on them.

Prices.—The amount sold in Germany for eating fresh bears no comparison to the quantities supplied to firms engaged in preserving. These prices, too, are subject to considerable variation according to the supply and demand at various times.

For preserving, the prices per lb. in the years named were as follows :—

1895.			1902.			1905.		
1st.	2nd.	3rd.	1st.	2nd.	3rd.	1st.	2nd.	3rd.
6d.	4½d.	2d.	5d.	3d.	1¾d.	5½d.	4d.	2d.

According to the official returns in 1900, the latest date for which particulars relating to this crop are available, there were about 17,000 acres under asparagus in Germany, of which 5,700 were in Brunswick and 3,200 in Hanover.

Among the various risks to which the crops, produce and live stock on the farm are exposed, that of destruction by fire is not the least, but it is one of the few risks against which farmers are able to protect themselves by insurance.

**Insurance of
Farming Stock
against Fire.**

The advantages of fire insurance are well known and generally recognized, and no farmer should be

deterred by the small annual expenditure involved from securing himself against loss from this cause.

The terms and conditions on which fire insurances in Great Britain are effected by all the principal insurance companies are practically identical, having been settled by a committee representative of about fifty of the leading companies in this country. As some of these conditions, which are of importance to insurers, are not perhaps always understood, it may be useful to summarize some of the principal points.

Conditions of Average.—The ordinary condition of average is in the following terms:—"Whenever a sum is declared to be 'subject to average,' if the property covered thereby at the breaking out of any fire be collectively of greater value than such sum insured, then the insured shall be considered his own insurer for the difference, and shall bear a rateable share of the loss accordingly."

For example: If property insured "subject to average" is insured for £500, but at the date of a fire is worth double that amount, the insurer will only be able to recover one-half of the damage, whatever be the amount of such damage. If the policy does not state that the property is insured "subject to average," the whole amount of the damage up to the sum of £500 can be recovered.

In policies of insurance of agricultural produce, including growing crops, fruit, wool, cheese, together with manures, artificial and other food for cattle, a special condition of "average," is generally inserted in the following terms:—

"If the sum insured on agricultural produce, either separately or in one amount with other property, shall at the breaking out of a fire be less than three-fourths of the value of all the property insured in that amount, then the insured shall be considered as being his own insurer for the difference between the sum insured and the full value of the property insured at the time of the fire, and shall bear a rateable share of the loss accordingly."

The effect of this condition is as follows:—Suppose the sum insured be £300, and the value of all the agricultural produce insured over the entire farm (together with any other property insured with the agricultural produce in one amount)

at the time of the fire to be not more than £400, the clause will not take effect, the sum insured being equal to three-fourths of the full value of the property, and the whole amount of loss up to £300 will be paid ; but if the sum insured be £300 as before, and the value £600, the average condition will come into operation, the sum insured being less than three-fourths of the value of all the property on which such sum is insured, and the office would therefore only pay one-half the amount of loss, whether that half be £300 or any smaller sum, the insured being his own insurer for the difference and bearing a rateable share of the loss accordingly.

In many policies "implements and utensils of husbandry and dead farming stock" are included in one sum with "agricultural produce," and the special average clause then applies to the whole amount.

In the absence of any provision to the contrary in the policy, agricultural produce also includes growing crops, and insurers should be careful to bear this in mind, as in a recent case of the destruction by fire of hay and straw in the stack it was claimed by the company, and decided in their favour, that the insurance included growing crops, and that, consequently, under the operation of the special "average" condition it was necessary, in order to obtain payment to the full value insured, that these crops, together with the whole of the other produce, should have been insured to at least three-fourths of their value.

On the other hand, policies on agricultural produce usually are expressly stated not to include :—

1. Hops and grain in any oast or kiln, while fire-heat is being used therein, or in any building adjoining any such oast or kiln, and not separated therefrom by a perfect stone or brick wall ; nor barley under process of malting.

2. The contents of any building in which hemp or flax is scutched or dressed, or in which screening of grain by power is done, or in which timber is sawn by machinery, nor the contents of any building adjoining another building, and not separated therefrom by a perfect party-wall of brick or stone, in which any of such processes may be performed.

3. Tanks and vessels (with the material contained therein) for dipping hop-poles, nor farming property within fifty yards of

any such tanks or vessels, or within fifty yards of any line of railway, and the value of this property therefore need not be taken into consideration.

Farmers, therefore, in order to get the full benefit of a policy of insurance as regards agricultural produce against risk of fire throughout the year, must insure for not less than three-fourths of the full value of the agricultural produce, immediately after harvest, which may be assumed to be the period when the property on the farm is at its maximum value. The point to be borne in mind is that if, on the occurrence of a fire, the valuer appointed by the company estimates the value of the whole of the property insured under the heading of "agricultural produce" at a sum exceeding by one-fourth the sum insured, then the company will probably dispute its liability to pay the full amount of the loss, even though it be less than the amount insured, but only offer a rateable proportion.

If any property insured is declared to be "subject to average," and it does not fall within the special condition above explained, the insurer in order to protect himself fully must insure for the full value of the property in question.

Rates of Insurance on Agricultural Produce.—The insurance of agricultural produce (including growing crops, implements, &c., which are allowed to be insured in one amount), is usually undertaken subject to the special condition of average at a charge of 7s. 6d. per cent. in England and Wales, and 10s per cent. in Scotland.

Proximity to a Railway.—Some companies require agricultural produce, including growing crops, within fifty or 100 yards of a railway line to be separately insured at a higher rate.

Wool.—Wool is included with other agricultural produce, but it may also be insured separately for a year or for any shorter period, usually at a rate of 3s. per cent., subject to the above stated special condition of average.

Hops.—Hops not undergoing any process of drying are included in the item agricultural produce, but hops in farm buildings (excluding hop oasts and stowages communicating therewith for any time during which fires are alight in the furnaces appertaining thereto) may also be insured for any period not exceeding three months at a rate of usually about 2s. 6d.

per cent. Provided such insurance be limited to any specified single building, the policy may be granted without any average condition.

Other Items Separately Insured.—Insurances are also granted on roots not stored in buildings ; on growing crops, by separate items ; on agricultural produce in any specified single building ; and on any specified stock, in each case without the average clause being applied.

Implements and Utensils of Husbandry.—These may or may not be included with the item of agricultural produce, and are charged at the same rate. If included with agricultural produce they become subject to the special condition of average, but not otherwise.

Some companies stipulate that not more than £40 shall be paid for loss on any one article, while others expressly exclude machines worked by steam, gas, oil, electric, water, or wind power, unless the same be specially mentioned as insured. Farmers possessing machinery worked by power are advised, therefore, to insure it as a separate and distinct item.

Items not Covered by Ordinary Farming Insurances.—As mentioned above, farm produce, and also the contents of any thatched building within 50 or 100 yards of a railway, as well as machinery worked by power, are excluded from ordinary farming insurances. In addition, the insurance does not cover hops and grain drying in oasts or kilns, or in adjoining buildings ; barley, under process of malting ; contents of any building in which hemp or flax is scutched or dressed, or in which screening of grain by power is done, or in which timber is sawn by machinery, or the contents of adjoining buildings not separated by a perfect stone or brick party-wall ; or the tanks, vessels, and material for creosoting hop-poles or other articles, and farm property within fifty yards of such tanks. These items should be insured separately.

Live Stock.—In the case of the insurance of animals on the farm against fire or lightning, the policies of the leading companies provide that if live stock is insured in one item, then in case of loss no animal is to be deemed of greater value than £40 ; if horses or cattle are insured in an item by themselves, then the limit of value payable in case of loss on each horse, or

on each head of cattle so insured, may be raised to £100, but in that case horses and cattle so insured must be excluded from the general insurance on live stock.

If it is desired to insure any horse, bull, ox, or cow for more than £100, or any other animal for more than £40, such horse, bull, ox, cow, or other animal must be specifically described and insured by itself for a stated sum.

Live stock insurance is not subject to "average," that is to say, the farmer can insure his stock for any amount, and not necessarily the full value or any fixed proportion thereof. The insurance covers deaths by lightning. The rate is usually 3s. per cent. per annum.

When live stock is to be temporarily removed for grazing purposes to land not included in the farm, the company should be informed, and the fact that they are covered by the insurance recorded on the policy.

It may be noted that although insurances may be effected for less than one year, the full annual premium is usually charged.

Germany.—According to the official report on the condition of crops in the middle of May, the average condition of winter wheat was 2·3, of spring wheat 2·5, of winter rye 2·7, of spring rye 2·4, of barley 2·3, and of oats 2·4 (very good = 1, good = 2, medium or average = 3). The winter and spring crops were generally satisfactory. Potatoes were not sufficiently advanced to be reported upon.

**Notes on
Foreign Crop
Prospects.**

Russia.—The Board have received through the Foreign Office a report translated from the official *Commercial and Industrial Gazette* of April 28th, O.S. (May 9th). It states that the condition of the winter grains in the twenty-two governments of the central zone may be described as unconditionally good. Hardly any unfavourable reports had been received, and taken in conjunction with the previous report as to the southern grain region, the state of winter grain in the principal districts is most favourable. Complaints began to be made, however, of the excessive dry weather, and in a later issue of the same paper (May 24th) it is stated that in spite of frequent rains of late, the region

feeling the effects of drought is gradually being extended. Besides the eastern governments, the central black earth zone, and the central Volga region, complaints of want of rain are more and more heard from the Kama and Sara regions and from the Upper Volga.

According to a report from Mr. Consul-General Smith, dated May 10th, the conditions in South Russia have been favourable, and the promise for the coming harvest seems to be extremely good. Rye and barley stand very high and promise full ears. They will probably begin to be cut about a month earlier than usual. Wheat looks very fine and will be early. Mr. Consul Medhurst, writing on the same date, says that the harvest prospects in the Rostov-on-Don Consular District are not so promising as they appeared a fortnight earlier.

Hungary.—The official report of the Minister of Agriculture estimates the probable yield of wheat at about $8\frac{3}{4}$ per cent. higher than the final results of last year's harvest; but in the case of rye, barley, and oats, these early estimates are rather below the out-turn of last year.

India.—The final official estimate of wheat crop puts the yield in 1906 at 8,560,000 tons, as compared with 7,519,000 tons in 1905 and 9,601,000 tons in 1904.

A means of improving the hygienic condition of cowsheds, stables, and piggeries which has proved very successful in

**Competitions for
Well-managed
Cowsheds.**

Belgium has been the institution of competitions among the various farms in a district, at which prizes are awarded for the best kept and managed cowsheds, &c. Opportunities but rarely occur for the introduction of those drastic improvements which would be recommended in the event of new sheds being built, but these competitions, by the personal interest and rivalry which they excite, encourage the execution of those minor alterations which can be easily carried out, as well as careful attention to cleanliness, drainage, and ventilation, and cannot fail to be most valuable as object-lessons in hygienic principles.

The method adopted in Belgium is described in papers read

by MM. Derwa, Giele, and Smeyers at the International Congress on "L'Alimentation rationnelle du Bétail," at Liège, 1905. The judges, who may consist of an agricultural instructor, a veterinary surgeon, and a cattle breeder, visit the farms of persons entered for the competition about May. They make a careful examination of the byres, and in consultation with the farmer discuss the improvements which can be effected. In the autumn they pay another visit to the place for the purpose of judging, and marks are awarded on the following scale :—

	In the case of Owners.	In the case of Tenants.
1. Buildings : arrangement, situation, &c. ...	20	10
2. Flooring	10	5
3. Liquid manure tank	10	5
4. Ceiling	10	5
5. Ventilation, lighting, temperature ...	20	35
6. Litter	5	5
7. General cleanliness	25	35

To be entitled to a prize, a competitor must obtain at least 65 points, and the amount of the prize is dependent on the number of points above 65.

At some of these competitions the number of entries is very large ; for instance, in 1905 there were 168 entries in one case and 180 in another, but generally the number is much less, averaging about 25.

In a report on the subject, M. Hendrick, Assistant State Agriculturist, observes that since the organization of these competitions the condition of the cattle byres has considerably improved, especially in regard to ventilation, lighting, and general cleanliness. In certain districts the sheds of most of the competitors were formerly in a deplorable condition as regards hygiene, whereas they are now absolute models. The competition serves, moreover, as an excellent stimulant, not only to those that take part in them but also to the owners, who are led in consequence to carry out improvements in the buildings. Moreover, the competition evokes a certain emulation among the farmers in the neighbourhood, and the example of those who take part is followed by those who do not.

**A Disease of
Young Cattle
in Ireland.**

For some years past the farmers of the county of Wexford and other districts of Ireland have lost numbers of young stock from an unrecognized disease, which is manifested by wasting, chronic persistent diarrhœa, extreme weakness, and prostration, eventually terminating in death.

The disease is being investigated on behalf of the Irish Department of Agriculture by Professor A. E. Mettam, Principal of the Royal Veterinary College of Ireland, and a preliminary report on the subject is given in the *Journal* of the Irish Department for April, 1906, to which those interested in the subject from a veterinary point of view should refer.

The predominating symptoms are progressive wasting and anæmia, with intermittent diarrhœa which defies the ordinary remedies. The fæces may be exceedingly watery for several days or weeks at a time, and ejected with great force and straining, and then for a time the dung becomes normal in appearance ; there may even be costiveness for a period, to be followed, however, by another attack of diarrhœa. Occasionally the dung is blood-stained, either red in colour or black, owing to changes in the blood-colouring matter present. Sometimes the odour of the discharges from the bowel is very offensive. The urine is normal in appearance ; occasionally it contains albumen.

The appetite is very capricious ; in some cases the animals will eat fairly well, even when exhaustion has progressed to such an extent that they are unable to stand, while in other cases the calves absolutely refuse to take any food for quite a week previous to death. Death is usually preceded by great debility and prostration, the patient lying stretched out for the last twenty-four hours or so of life.

The investigations, so far as they have gone at present, have not led to any conclusive result, but it is recommended that the animals be housed for a longer time than has been the custom hitherto, that plenty of good dry food be given, and that a clean and dry bed be provided.

The Board would be interested to know of the occurrence of any cases of this disease in Great Britain.

The Argentine Government have published a Decree, dated April 6th, 1906, abolishing quarantine in the case of animals of the equine species on their arrival in Argentina, and imposing a period of sanitary observation in the lazaretto lasting from six hours to ten days, with a further observation in their place of destination. It provides that the official veterinary surgeons at the port shall carry out a clinical examination within the first six hours, and if there is any doubt as to the health of the animal, or if it has been in contact with animals suspected of being diseased, they may carry out the mallein test, and impose a stay of ten days in the quarantine station.

**Importation
of Horses into
Argentina.**

If the clinical examination does not give rise to suspicion of disease the owner may convey the animal to any place selected by him, with the consent of the authorities, but he is required to note the health of the animal for three months, and to communicate any alteration he may observe to the Department.

Owners who desire to dispose of breeding animals immediately without submitting them to this sanitary observation may, after the six hours mentioned above, ask for the mallein test to be applied in the lazaretto in accordance with Article 53 of the Animals' Sanitary Regulations.

According to a summary of departmental instructions for the guidance of Stock Inspectors at Transvaal ports of entry, dated June 1st, 1905, the following regulations control the importation of cattle, horses and sheep into the Transvaal from Great Britain:—

**Live Stock Import
Regulations.—
Transvaal.***

Cattle.—No cattle will be admitted into the Transvaal unless the owner has previously applied for and obtained a written

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; Cape Colony, Feb., 1905; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; and Tasmania, March, 1906.

permit from the Department of Agriculture, Pretoria. This permit must be presented to the Stock Inspector with the animals at the port of entry specified in the permit.

When applying for a permit the following particulars must be furnished :—Name of owners ; the locality from which the cattle come ; the purpose for which they are being introduced ; the number of animals to be introduced ; the stations at which they are to be trucked and derailed ; the name of the consignee and ultimate destination of the animals.

Horses.—All persons introducing horses into the Transvaal must produce certificates, signed by a duly qualified veterinary surgeon, stating that the animals are free from disease, and that they have been tested with mallein and have reacted in a normal manner. If any horse is presented for admission without a certificate it will either be tested with mallein by the Stock Inspector and allowed to enter after the Inspector is satisfied that the animal is free from disease, or it may be allowed to proceed to its destination and be tested there, whichever course is most convenient to the Department.

Sheep.—Sheep are subject to examination at the port of entry, and are liable to detention if found affected with scab.

Pigs.—The regulations for the importation of pigs into the Colony appear to be those given in Government Notice No. 741 of 1903, these regulations being as follows :—(1) The pigs must be accompanied by a certificate, signed by a veterinary surgeon, stating that the pigs have not come from an area infected with swine fever. (2) A certificate must be obtained from the veterinary officer stationed at the seaport at which they arrived in Cape Colony, stating that the pigs are healthy and have not been exposed to infection at the seaport. (3) The pigs must be taken direct from the ship to an approved kraal, entrained without delay, and despatched direct to any proclaimed port of entry in the Transvaal, where they will be examined by a veterinary officer before being allowed to proceed.

A new law dealing with the subject of margarine in Sweden came into force on the 1st May, 1906, and superseded the earlier law of 1899.*

**Swedish
Margarine Law.**

Margarine and margarine cheese are defined by the new legislation as substances resembling butter and cheese respectively which contain fat not derived from milk ; and artificial fats (for human consumption) as substances which contain fat other than swine-fat. The Act does not apply to unadulterated fats of animals or plants when they are sold under a designation which clearly indicates their origin.

Sesame oil must be added to margarine during the process of manufacture in the proportion of at least 10 per cent. of the fats or oils employed. The proportion is at least 5 per cent. in the case of margarine cheese. The percentage is calculated apart from the amount of sesame oil which is added.

Persons who manufacture butter or cheese for sale are not allowed to manufacture margarine or margarine cheese on the same premises, and it is forbidden to keep margarine, or the fats employed in its manufacture, on premises where butter is made, packed, or stored for export.

Any person desirous of manufacturing margarine or margarine cheese otherwise than for his own household must inform the authorities. The factory is placed under the control of a Government inspector, who sees that the regulations are properly carried out, and that only good and wholesome materials are used and produced, according to the direction of the Academy of Medicine. The inspector has access at all times to premises where the goods are made and stored, and he is bound to respect trade secrets. He receives a fee which is paid in advance by the manufacturer to the local authority, who determine the amount according to the size of the factory and other circumstances. If the manufacturer allows the payment to fall into arrear, the authorities have power to stop work at the factory until the arrears are paid. If the inspector resides more than two kilometres from the factory he can also claim travelling expenses.

* See *Journal of the Board of Agriculture*, Vol. V., p. 338. Dec. 1898.

Persons who, except for consumption in their own households, manufacture or trade in margarine, must keep it in vessels which are either quadrangular, or of such an oval form that the length is at least half as much again as the breadth. The words "Margarine," or "Artificial Fats," as the case may be, must be clearly branded, or otherwise durably imprinted on the base, top, and sides of the receptacle, in letters at least 3 centimetres high, together with the name of the manufacturer, or of the importer if the article has been imported. In the retail trade the goods may be exposed for sale in smaller quantities, but they must have a clearly visible label with the proper designation. Margarine cheese must have the words "Margarine Cheese" impressed upon each surface in letters at least 3 centimetres high, as well as the name of the dairy where it was produced; and the exterior must also be coloured with Orleans red or some other non-poisonous dark red colour. The above regulations concerning packing, colouring, &c., apply equally to imported and exported goods. If the goods are not offered for sale in vessels of the prescribed form, they must be delivered in a wrapper bearing the words "Margarine," &c., in clear type. Shops, markets, booths, vehicles, &c., where such goods are on sale must also have a clearly visible notice indicating the fact, and in all commercial papers such goods must be specified under their proper designation.

Imported goods, declared at the Custom House to be margarine, &c., if not packed according to the regulations, cannot be removed until they are properly shaped and packed by the importer. Margarine which is exported must be marked as of foreign manufacture unless its Swedish origin is proved. Imported and exported margarine or margarine cheese must contain the legal amount of sesame oil, which must be duly declared and attested. If imported or exported goods which are not declared as margarine, &c., are nevertheless suspected, or if the regulations are not followed, the Customs officers must immediately inform the local authorities, who will cause a sample to be taken for examination, after payment of the duty. The cost of analysis is paid by the State unless the goods are adulterated, in which case the owner pays. Samples of margarine and margarine cheese may also be taken generally by various officials.

Contravention of the regulations is punishable by fines, confiscation of the goods, notices in local newspapers at the defendant's expense, or by imprisonment.

The chief factors which have combined to further the progress of the Sussex poultry industry are division of labour ; the efficiency and simplicity of the methods employed ; localization, and all that that implies economically ; and the advantages of an elastic commercial organization, without that loss of independence which is more or less associated with the membership of a private co-operative concern.

**Sussex Poultry
Methods.***

Although in certain circumstances what may be termed "all-round" poultry production may be successful, it is generally recognised that the commercial poultryman should specialize ; and the industry is being split up among producers of eggs for table, eggs for incubation, chicken rearers, chicken fatteners, &c.

Those engaged in the Sussex industry have always specialized in the production of fattened chickens, and in the majority of cases the work is divided between the rearers and the fatteners, while the collecting and forwarding to market form the special department of the local firms of carriers. All who are practically engaged in poultry production, and have had experience of the innumerable details involved in any branch, will appreciate the many advantages of this division of labour.

The methods employed by rearers and fatteners are both simple and efficient. It would be incorrect to say that artificial methods of hatching and rearing are unknown in Sussex, but it is no exaggeration to state that those who employ them form but a very insignificant proportion of the whole.

Hens are almost invariably used for hatching and rearing, and in nearly every month of the year, and under the most variable climatic conditions, the young broods are cooped in the open fields. This open-air treatment, combined with frequent change of rearing grounds and the freedom of ample

* See previous note by Mr. Hurst on this subject (*Journal*, March, 1906), and "Poultry Fattening," (*Journal*, May, 1906).

grass runs, is found conducive to the perpetuation of the hardiness which distinguishes the local breed of fowl.

This method of rearing, with the feeding of Sussex ground oats, which forms almost the entire diet during the rearing period, matures the birds sufficiently for the fattener's purposes in from twelve to sixteen weeks.

When the chickens are of a sufficient size, they are collected from the rearers and transferred to the coops of the fatteners, where they remain from three to four weeks, according to the rapidity with which they individually respond to the fattening process, and "ripen" for killing. The diet during this finishing period is still composed primarily of Sussex ground oats, with the addition of skim milk and fat; it is fed in a more liquid state than to the running birds, during the first part of the time in troughs, and finally mechanically by means of a cramming machine.

The Sussex poultry producer does not suffer from the disadvantages of many poultry keepers elsewhere in being more or less isolated and at a consequent disadvantage as regards foodstuffs, transport, freightage, and markets. On the contrary, he enjoys not only the reputation that attaches to an old-established localized industry, but the benefits derived from the existence in one neighbourhood of a large proportion of skilled persons engaged in the same occupation. This factor tends to fixity, as no equal advantages are obtainable by migration. The natives grow up into a kind of natural efficiency which is never so fully acquired by others from outside, and the demand for the produce being constant and increasing, there is a regular market for the labour of both sexes, without sufficient fluctuation to produce serious or widespread periods of depression. The traffic by road and rail has necessarily become fully organized, with a consequent reduction of the charges and the duration of transit. There has also been a corresponding growth of such supplemental trades as the special mode of milling, coop and crate making, &c. All these considerations, in conjunction with the renown of the district for its special kind of produce, obviously tend considerably to reduce the cost of production and to increase the marketable value.

The innate suspicion with which so many English agricul-

turists appear to regard combination and co-operative organization, when represented by associations and societies, is avoided by the purely commercial organization which grows up in and around such a localized industry as that of the Sussex chicken producers. They participate in the general benefits of such an organized method of trading, without losing their individual entity or binding themselves to any strictly dependent line of action.

In the ordinary course of systematized trading the chickens are collected from the rearers and the price paid throughout the district is practically uniform, subject to the slight differences due to distances from the centres, and if one collector is objected to there are many more from whom to choose. Within a wide radius the carriers collect the dead poultry, forward it to market, and return the empty crates; and the sender has the choice of two London (and some provincial) markets, and is free to choose and change the destination and the salesmen without losing the benefits of the reduced charges accruing from the heavy consignments of a whole community.

These are some of the facts which are unfortunately not always appraised at their full value by those who are persuaded to attempt rivalry under less favourable conditions.

J. W. HURST.

The Hereford Co-operative Fruit-Grading Society, which was registered in July, 1905, was formed on the initiative of the Hereford Fruit-Growers' Association. In

The Hereford Co-operative Fruit-Grading Society.

In the latter part of 1904 papers on "Fruit Grading and Packing" were read before this Association by Mr. H. P. Bulmer and Mr. John Reade, and a small committee was formed, under the chairmanship of Mr. John Riley, of Putley Court, Ledbury, to consider whether practical effect could be given to the ideas put forward in the papers.

This Committee at once communicated with the Agricultural Organization Society, and asked their advice as to the best means of forming a Co-operative Society for the grading, packing, and marketing of fruit. An interview took place at

Worcester between Mr. J. Nugent Harris (the Secretary of the Agricultural Organization Society) and Messrs. Riley and Bulmer, in the course of which Mr. Harris recommended the Committee to approach the Great Western Railway Company in the hope that they would provide premises for the undertaking. A meeting was arranged between Mr. T. H. Rendell, the Chief Goods Manager of the Great Western Railway, and Messrs. Riley and Bulmer, when Mr. Rendell expressed his willingness to assist the project. An admirable site served by a siding was suggested by Mr. Rendell, and the Directors of the Great Western Railway Company finally consented to erect a depôt and provide facilities for the working of the proposed Society.

Special rules were drafted and a prospectus drawn up inviting subscriptions of preference shares to the value of £500, the ordinary shares being fixed at 5s. fully paid up and being unlimited in number. When the Society was registered, the Committee secured the services, as manager, of Mr. W. H. Press, of Newport, who had had great experience in the distributing fruit trade, and temporary premises were opened early in September for the receipt of the members' fruit. Subsequently the business was removed to the commodious depôt provided by the Great Western Railway Company.

The classes of fruit chiefly dealt with are apples (other than cider apples) and pears. These are carefully graded and different prices are fixed for each grade, a member being paid according to the amount realized by the fruit in each grade received from him.

Particular attention is also paid to the packing, and the importance of both grading and packing are shown in the enhanced prices which the Society has been able to realize for the fruit.

Two examples may be given of this. One member, observing the difference between the ordinary market price and the price which the Society was able to pay, bought, as a speculation, a quantity of apples, for which he paid £26 in Hereford Market. He then sold them through the Society, which, after grading them, realized such prices upon them that they were able to pay him £30 for them.

Another member sent in some pears of the variety called "Doyenné de comice," and as he had not handled them with sufficient care, they did not realize their full value, and the Society was only able to pay him 28s. per cwt. for them. Nevertheless, the member asked, when handed his cheque, if there were not a mistake. He had previously been accustomed to sell the pears for perry for £2 10s. to £3 10s. per ton, equivalent to 2s. 6d. to 3s. 6d. per cwt !

The total sales of the Society in the four months during which it was at work in 1905 amounted to £2,144. Since the slack season in the fruit trade, the Society has, on the recommendation of the Agricultural Organization Society, taken up the supply of agricultural requirements, and in the first four months of 1906 it did a business of over £1,200 in this department. The great advantage of combining the fruit grading with the supply of requirements is that, if fruit grading alone were undertaken, there would be certain seasons during which the staff would be virtually unemployed. The profits made on the supply of requirements are more than covering the salaries of the staff during the slack season.

In connection with the suggestions made in Leaflet No. 120 for the prevention of peach leaf curl, it should be noted if

Peach Leaf Curl.

the disease appears on the same tree year after year in spite of spraying, it proves that the mycelium of the fungus has entered the branch and attacks the young leaves each season.

Under these circumstances spraying is of no avail.

Every branch showing a tuft of "curled" leaves should be cut off. It is only necessary to make the cut about two inches behind the terminal tuft of diseased leaves, as the mycelium present in the branch never extends backwards, but follows in the direction of growth. If this is done at once, before the fungus forms spores on the diseased leaves, the trees should be free from disease next season.

According to the regulations under the Insect Pests Amendment Act, 1898, which were published in the *Government Gazette*

of Western Australia on August 1st, 1902, the importation of grape vines is absolutely prohibited. Vine cuttings must be surrendered to the Inspector at the port of debarkation, and must be quarantined by the Department of Agriculture for a period of not less than twelve months, the person concerned in their importation receiving them at the expiration of the period of quarantine as rooted vines, after making certain payments. Any cuttings infested with insect pests or fungous diseases injurious to grape vines or other trees or plants are to be destroyed at the expense of the importer.

All fruit, fruit trees, plants, cuttings, &c. must be disinfected by the Inspector at the port where they are unloaded, and if found diseased or infested with insects shall remain in quarantine for fourteen days. The importation into Western Australia of any fruit, plant, or part thereof, infested with the codlin moth, mussel scale, nematodes, or bacterial disease, &c., is absolutely prohibited. Soil or compost, as well as fruit cases containing vegetables or vegetable matter, must be disinfected. These orders do not apply to any port or part of Western Australia north of the 26th parallel of south latitude. South of this parallel importation is limited to the ports of Albany, Fremantle, Geraldton, and Esperance.

During recent years rats appear to have become much more numerous in most parts of the country, and the damage they cause to crops, poultry, game, and even young trees is undoubtedly very great.

The Destruction of Rats by Virus.

Until recently the usual means of destruction consisted of traps, poison and ferrets, but during the past few years attention has been given to inoculation with a virus, which sets up a virulent disease in the animals and quickly kills them. There are several such preparations before the public, some of which are fluid and some solid. Perhaps, on the whole, the fluid preparations are the most convenient to use, and they are certainly quite as effective as the others. The material consists of a nutrient medium containing the organisms

(bacilli) which, when introduced into the body of a rat, set up a disease allied to the most virulent form of typhus fever. Dry bread, cut into small cubes, is soaked with the virus, and these cubes being laid down in suitable places are readily eaten by the rats, usually with fatal results. No domestic animals are at all affected by the preparation.

In order to test the value of the method the Agricultural Chamber of the Province of Saxony obtained a supply of one of the preparations and distributed it amongst seven selected farms. The results* show that at six of the farms the rats were practically exterminated. At the seventh the virus appears to have had little effect, a result that has also been noticed elsewhere, and which is supposed to be due to the fact that a natural attack of the same or a nearly-related disease had rendered the surviving rats practically immune to infection.

Information of a similar character has reached the Board with regard to the use of rat virus in England, and they would therefore direct the attention of agriculturists to this means of getting rid of a troublesome pest. While there seems to be little doubt that in the majority of cases a single farm may be temporarily cleared of rats by this means, it is evident that but a short time may elapse before such a farm is again invaded by animals that move on to it from infested places in the neighbourhood. It would therefore appear to be highly desirable that agricultural clubs should take the matter up and act on a large scale, or the farmers in a parish or county might enter into a temporary association for the purpose of using the virus on every farm on a definite date. Operations on a large scale would mean considerable attention as to organization, but the probable result would appear to warrant the necessary steps being taken.

The Eighth International Agricultural Congress is to be held at Vienna from the 21st to the 25th May, 1907. Persons desirous

**Agricultural
Congress
at Vienna.**

of attending the Congress should inform the Executive Committee, through the Secretary, Prof. Josef Häusler, Schauflegasse 6, Vienna, not later than 31st March, 1907. The subscription is 20 kronen (16s. 8d.). Agricultural

* *Mitt. d. Deut. Land. Gesellschaft*, May 5th, 1906.

societies and associations may be represented by delegates, the same subscription being payable for each delegate. Copies of the reports and other publications of the Congress will be furnished gratuitously to each member.

The Congress will comprise public meetings as well as private sittings of the various sections and sub-sections, and members can also take part in the excursions and visits which will be arranged to places of agricultural interest. The work of the Congress will be divided among eleven sections, as follows:—

Section 1.—Rural economy; associations; personal credit; mortgages; agricultural statistics; means of communication and trade in their relation to agriculture and forestry; international agreement as to the price of the products of agriculture and forestry; rural hygiene; agricultural insurance.

Section 2.—Education in agriculture and forestry; experiments, including the cultivation of peat land.

Section 3.—Labour and cultivation; agricultural machinery and implements.

Section 4.—Breeding of live stock and veterinary matters, including dairying, poultry-keeping, bee-keeping and silkworm culture.

Section 5.—Improvements in agriculture and forestry; irrigation and draining, control of streams, agricultural operations, protection against injury from torrents and avalanches.

Section 6.—Agricultural industries (sugar, alcohol, starch, oil, beer, and malt); the utilization of wood.

Section 7.—Insects and fungi.

Section 8.—Forestry.

Section 9.—Fish-breeding.

Section 10.—Vine growing.

Section 11.—Fruit and vegetable growing; horticulture; utilization of fruit and vegetables.

The rules of the Congress provide that reports and communications intended to be read must be submitted to the Executive Committee before 1st December, 1906; they should be as concise as possible, and their conclusions should be of sufficient general importance to merit discussion by an international assembly. The German, French, Italian, and English languages will be recognised for purposes of discussion.

The Council of the Surveyors' Institution have decided to offer annually the following scholarships, tenable for three years by students of the Institution, viz., one of £80 per annum at Cambridge University, one of £50 at the University College of North Wales, Bangor, and one of £50 at the Armstrong College, Newcastle-on-Tyne. Holders will be required to take the Natural Science Tripos and the examinations for the Diploma in Agriculture at Cambridge, or the equivalent for those examinations at the other Universities. The first examinations will be held at Cambridge, Bangor, and Newcastle-on-Tyne respectively during the summer of 1906.

**Scholarships
Awarded by the
Surveyors'
Institution.***

Further particulars may be obtained from the respective Colleges, or from the Secretary, the Surveyors' Institution, 12, Great George Street, London, S.W.

An important advance in the development of the forestry branch of Armstrong College, Newcastle-on-Tyne, has been effected by an agreement between H.M. Office of Woods and the College authorities, under which the latter take over the local management of Chopwell Woods, in the county of Durham. These woods, which are within a few miles of the College, extend over an area of nearly 900 acres, and carry crops of larch, spruce, Scotch pine, oak, ash, and other trees, most of which were planted about fifty years ago. The woods will be gradually brought under a proper rotation of cropping by the clearing and replanting of the more mature portions from time to time, and the carrying out of this work will afford favourable opportunities for demonstrating the various operations relating to practical forestry.

Mr. J. F. F. Horner, H.M. Commissioner of Woods, has obtained the consent of the Treasury to a house being provided in the woods as a residence for the College lecturer in forestry, Mr. A. C. Forbes, and to continue to pay as heretofore the ordinary working expenses of the woods. The arrangement will

* *Journal*, Vol. XII., p. 565, Dec., 1905.

facilitate the holding of short courses for practical foresters and others desirous of acquiring a knowledge of the subject, while as a practical demonstration area for the students attending the College forestry class the woods will be invaluable, and should render Newcastle an excellent centre for forestry instruction.

The disease known as "Slime-flux" is due to the activity of certain very minute yeast-like organisms, which set up fermentation and subsequent dissolution of the elements of the wood and bark. This results in the formation of weeping wounds.

**"Slime-flux"
on Beech Trees.**

If such wounded parts are removed at an early stage, the cavity treated with a fungicide, and afterwards carefully closed, but little injury follows. On the other hand, if the disease is allowed to run its course, the wood becomes sodden with water, and the tree eventually dies.

Enquiries are occasionally made as to the construction of what are known as "dewponds," and it is thought that the following extract from a book* by Messrs.

Dewponds.

A. J. and G. Hubbard may be of interest:—

"There is still in this country at least one wandering gang of men who will construct for the modern farmer a pond which in any situation in a sufficiently dry soil will always contain water—more in the heat of summer than during winter rains. This water is not derived from springs or rainfall, and is speedily lost if even the smallest rivulet is allowed to flow into the pond. The gang of dewpond makers commences operations by hollowing out the earth for a space far in excess of the apparent requirements of the proposed pond. They then thickly cover the whole of the hollow with a coating of dry straw. The straw in its turn is covered by a layer of well-chosen, finely-puddled clay, and the upper surface of the clay is then closely strewn with stones. Care has to be taken that the margin of the straw is effectively protected by clay. The pond will gradually become filled with water the more rapidly the

* "Neolithic Dewponds and Cattle-Ways." (Longmans, 1905.)

larger it is, even though no rain may fall. If such a structure is situated on the summit of a down, during the warmth of a summer day the earth will have stored a considerable amount of heat, while the pond, protected from this heat by the non-conductivity of the straw, is at the same time chilled by the process of evaporation from the puddled clay. The consequence is that during the night the moisture of the comparatively warm air is condensed on the surface of the cold clay. As the condensation during the night is in excess of the evaporation during the day, the pond becomes, night by night, gradually filled. Theoretically, we may observe that during the day the air being comparatively charged with moisture, evaporation is necessarily less than the precipitation during the night. In practice it is found that the pond will constantly yield a supply of the purest water.

“The dewpond will cease to attract the dew if the layer of straw should get wet, as it then becomes of the same temperature as the surrounding earth, and ceases to act as a non-conductor of heat. This practically always occurs if a spring is allowed to flow into the pond or if the layer of clay (technically called the ‘crust’) is pierced.”

During the harvest season the Meteorological Office will, as before, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment

**Harvest Weather
Forecasts.**

of the cost of the telegrams. The forecasts will be so worded that the cost of each message will be 6d. for any one district, including an address of three words. If the address to which the forecasts are to be sent exceeds three words, an addition of a halfpenny for each additional word must be made to the cost of the daily telegram.

The harvest forecasts are prepared at 3.30 p.m. daily from June 1 to September 30 (except Sundays), and are applicable to the twenty-four hours from midnight following the time of issue.

Applications for the forecasts may be made on a form which can be obtained from the Secretary, Meteorological Office, 63, Victoria Street, London, S.W.

**Weather
Forecasts in
Prussia.***

The Prussian Agricultural Department has arranged for an improved service of weather forecasts which is expressly designed for the use of farmers. The principal feature of the new service is the increased prominence which is to be given to the weather chart or map, on which is marked the atmospheric pressure, the temperature, clouds, direction of the wind and the rainfall over Europe. These particulars will be telegraphed between nine and ten each morning to nine meteorological stations, where they will be recorded on the chart, and to this the Director of the station will add, as briefly as possible, his forecast of the weather for his own district during the ensuing twenty-four hours. This chart will be manifolded immediately and despatched by post, and it is hoped by this means to secure its distribution in the country before evening. By rapid circulation at a very low charge (6d. per month) it is anticipated that the value of the chart will become more generally recognised than has hitherto been the case. It will be exhibited at all telegraph offices, public offices, schools, &c.

The forecasts will also be communicated by telegraph, and where necessary the forecast will be adapted to different parts of the meteorological district. They will be sent by the Director to the telegraph office at eleven o'clock in the morning, and thence will be despatched to all telegraph offices in the district, where they will be exhibited before noon.

It is recognised that at first these telegraphic forecasts will attract very much more attention than the weather charts, not merely because they appear earlier, but also because they are easily understood and do not require close examination. Those who are prepared to give a little attention to the matter, will, it is thought, soon appreciate the value of the charts, because they show the causal connection of the forecast with the weather of the previous day, and of other neighbourhoods, and without the chart it is impossible to grasp the considerations which led up to the forecast. A study of the chart might, perhaps, be dispensed with if the forecasts were always absolutely accurate, but as this cannot be expected, the more distant a

* *Deutsche Landw. Presse*, April 21st, 1906.

place is from the station the more frequently must the forecast be in error. An examination of the chart for a few moments daily, however, should enable anyone to make a local adjustment of the forecast which might prove very valuable.

Protection of Fruit Trees from Frost.—In connection with a previous note in this *Journal* (April, 1906, p. 57) as to the protection of fruit trees from frost, the following note by Mr. Consul-General Bennett may be of interest:—“Burning oil in

**Miscellaneous
Notes.**

metal pots to protect fruit trees from the effects of frost has been practically abandoned in California on the ground that the smoke is so dirty that it ruins the fruit by the deposit of the oily smuts. Fires of brush and refuse lighted to windward are sometimes resorted to, but a better substitute is the burning of sawdust in specially constructed holed tins, which are conveyed through the orchard on a waggon. The resulting smoke is very thick, and in order to avoid too rapid combustion it is necessary to use a small spray pump on the waggon to counteract the tendency to flame. Another plan, which is expensive but successful, is a combination of smudges and water. The trees are covered with burlap, removable of course, mounted on iron posts, with wire about 16 ft. in the centre and sloping to 8 ft. at the sides. Small irrigation canals are run in parallel lines under the burlap the full length of the orchard. These are filled with water at a temperature of 65 deg., pumped from a well at the rate of 3,000 gallons an hour. The water then runs to waste, and on issuing at the further end of the orchard has lost about 10 deg. of heat. At the same time smudges are lighted at each end of the orchard and the suction of air under the awning draws in the smoke and creates an excellent smudge.”—(*F.O. Report, Annual Series, No. 3,564*.)

Swedish Agricultural Meeting.—The twentieth Agricultural Congress of Sweden will be held this year at Norrköping (about four hours from Stockholm), from July 2nd to July 8th. This gathering, which is representative of the whole of Sweden,

is usually held every fifth year, and comprises a live stock show and a general exhibition of produce, machinery, and other articles connected with agriculture, horticulture, dairying and forestry. Lectures are given and conferences held on various subjects.

Demand for Agricultural Machinery in Mexico.—According to a note in the *Board of Trade Journal* (April 26th, 1906) there is an increasing demand in Mexico for farming machinery of all kinds: the trade at present all goes to the United States. The Canadian Commercial Agent suggests that some large firm, or several smaller ones combined, making different classes of implements, should send a representative to make a thorough investigation. He also suggests the establishment of a *depôt* showing a full collection of samples in charge of a competent salesman. The majority of the sales could be made for cash.

Demand for Agricultural Machinery in Italy.—H.M. Consul at Rome (Mr. C. C. Morgan) reports that the scheme for opening that district to agriculturists is gradually assuming a tangible form. The improved general conditions of the country, whereby Rome has necessarily benefited as the capital of the Kingdom, the reviving spirit of enterprise on the part of the Italians, and the effects of the present tariff, are, Mr. Morgan says, contributing factors towards the agricultural development of the district. Firms in the United Kingdom dealing in agricultural machinery such as steam ploughs, reapers, threshers and similar implements ought, he says, to take advantage of the present favourable moment in order to place their goods conspicuously before the Italian public. It is advisable, he adds, to have specifications printed in Italian, and to give measurements and quotations in accordance with the decimal system.—*Board of Trade Journal*, 17th May, 1906.

Importation of Fruit, &c., into New Zealand.—The *New Zealand Gazette* for 22nd March last contains an Order-in-Council, dated 12th March, 1906, notifying that, in accordance with the provisions of "The Orchard and Garden Pests Act, 1903," the following articles are absolutely prohibited from being imported into New Zealand:—Fruit infected with the apple-scab or black-spot, and potatoes or tomatoes affected by the Irish potato disease or by late blight.

ADDITIONS TO LIBRARY DURING MAY.

Africa—

Natal.—Land Board, Report for 1905. (15 pp.)

Natal.—Government Entomologist Report for 1904-5. (17 pp.)

Transvaal.—Report of the Director of Agriculture, 1904-5. (486 pp.)

Australia—

Victoria.—Year Book of Agriculture, 1905. (448 pp.)

Canada—

Minister of Agriculture.—Report for 1905. (lxxviii. + 54 pp.) Appendix to Report:—Experimental Farms, Reports for 1905. (461 pp.)

Denmark—

Koch, W. A.—Fjerkræavlens Standpunkt i Nordeuropa. (156 pp.) 1906.

France—

Huffel, G.—Economie Forestière. Tome 2e. (484 pp.) 1905.

Association amicale des Anciens Élèves de Grignon.—Annales de Grignon, 1905. (354 pp.)

Germany—

Thaer, A.—Landwirtschaftliche Unkräuter. (xxiv. plates.) 1905.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 116:—Die Landwirtschaftliche Gesellschaftsreise durch Dänemark und Schweden. (110 pp.) 1906.

Great Britain—

Aberdeen and North of Scotland College of Agriculture:—

Bull. 4. Report on Turnip Experiments, 1904-5. (36 pp.)

Bull. 5. Report on Manuring of Hay, 1906. (13 pp.)

Bath and West of England Society.—*Journal*, 1905-6. (236 + clxxxiv. pp.)

Collinge, W. E.—Report on the Injurious Insects and other Animals observed in the Midland Counties during 1905. (58 pp.) 1906.

India—

Memoirs of the Department of Agriculture in India. Entomological Series, Vol. I., No. I. The Bombay Locust (112 pp. + xi. plates.)

Agra and Oudh.—Department of Land Records and Agriculture, Report for 1904-5. (18 pp.)

Ireland—

Department of Agriculture and Technical Instruction.—Report for 1904-5. (493 pp.)

Italy—

Casalini, Dr. M.—La Vendita del Latte per l'Alimentazione Umana. (74 pp.) 1906.

Japan—

Imperial Central Agricultural Experiment Station. Bulletin. Vol. I., No. I. (94 pp.)

Switzerland—

Secrétariat Suisse de Paysans.—Recherches relatives à la Rentabilité de l'Agriculture Suisse, 1904. (117 pp.)

United States—

Bureau of Entomology:—

Circ. 72. Key to the known Larvæ of the Mosquitoes of the United States. (6 pp.) 1906.

Circ. 74. The Periodical Cicada in 1906. (5 pp.) 1906.

Technical Series, No. 11:—A Classification of the Mosquitoes of North and Middle America. (31 pp.) 1906.

Farmers' Bulletins:—

No. 246. Saccharine Sorghums for Forage. (37 pp.) 1906.

No. 249. Cereal Breakfast Foods. (36 pp.) 1906.

No. 252. Maple Sugar and Sirup. (36 pp.) 1906.

Bureau of Soils:—Bull. 32. The Absorption of Phosphates and Potassium by Soils. (39 pp.) 1906.

Cornell University:—Bull. 236. The Blight Canker of Apple-Trees. (99-138 pp.) 1906.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of May, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 8	7 5	36 4	33 5
Herefords	7 10	7 4	—	—
Shorthorns	7 7	7 0	35 8	32 10
Devons	7 4	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	8½	6½
Sheep :—				
Downs	8½	8	—	—
Longwools	8	7¼	—	—
Cheviots	9	8½	9½	8½
Blackfaced	9	8¼	9½	8½
Cross-breds	8¼	7½	10	9
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 11	6 6	6 9	6 1
Porkers	7 5	6 11	7 4	6 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 4	17 4	21 1	17 4
„ —Calvers	20 6	16 9	19 2	16 6
Other breeds—In Milk ...	16 18	14 3	16 18	14 14
„ —Calvers	12 0	10 4	17 12	14 16
Calves for Rearing	2 1	1 12	2 10	1 15
Store Cattle :—				
Shorthorns—Yearlings ...	9 4	7 13	9 5	8 2
„ Two-year-olds	12 19	11 5	14 3	12 3
„ Three-year-olds	16 17	14 14	16 4	13 15
Polled Scots—Two-year-olds	—	—	14 13	12 18
Herefords— „	15 2	13 17	—	—
Devons— „	12 5	10 16	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	48 8	43 9	—	—
Scotch Cross-breds	—	—	41 10	36 3
Store Pigs :—				
Under 4 months	30 11	23 3	26 8	20 6

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of May, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
BEEF :—		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
English	1st	50 0	50 0	52 6	—	52 0*	50 0*
	2nd	47 6	45 6	47 6	—	51 6*	45 6*
Cow and Bull	1st	—	43 0	42 6	38 0	43 6	41 6
	2nd	—	38 0	37 6	34 6	32 6	35 6
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	48 6	48 0	47 6	47 6	—	48 0
	2nd	45 6	44 0	45 0	44 6	39 6	—
Argentine Frozen—							
Hind Quarters ...	1st	27 6	31 0	32 0	30 6	31 6	31 6
Fore „ ...	1st	22 6	24 6	23 6	24 0	24 0	23 0
Argentine Chilled—							
Hind Quarters ...	1st	36 6	38 0	37 6	35 6	—	37 6
Fore „ ...	1st	28 6	27 6	28 0	26 0	—	27 6
American Chilled—							
Hind Quarters ...	1st	50 0	50 0	50 0	49 6	50 6	52 6
Fore „ ...	1st	34 6	33 0	32 6	32 0	33 0	34 6
VEAL :—							
British	1st	64 6	66 0	73 6	78 0	—	—
	2nd	59 6	57 0	67 0	73 0	—	—
Foreign	1st	64 6	—	—	—	—	61 6
MUTTON :—							
Scotch	1st	76 0	—	79 6	78 6	78 6	77 0
	2nd	70 6	—	74 6	73 6	73 0	66 6
English	1st	69 0	69 0	76 0	71 0	—	—
	2nd	60 6	58 0	71 6	66 0	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	68 6	72 0	70 6	71 0	—
Argentine Frozen ...	1st	32 6	35 6	36 6	36 0	37 6	36 6
Australian „ ...	1st	30 6	32 0	33 0	33 0	35 0	—
New Zealand „ ...	1st	40 0	39 6	41 6	41 0	—	—
LAMB :—							
British	1st	89 0	88 0	94 0	91 6	108 6	95 0
	2nd	78 6	80 0	88 0	84 6	97 0	80 0
New Zealand	1st	46 0	48 6	47 0	46 6	53 0	54 0
Australian	1st	37 6	40 6	38 6	39 6	42 0	43 0
Argentine	1st	37 6	40 0	39 6	39 6	42 0	41 0
PORK :—							
British	1st	61 0	66 0	56 6	58 0	59 6	56 0
	2nd	55 0	55 6	52 6	54 0	57 0	48 6
Foreign	1st	58 6	59 0	58 0	58 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (in 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21 ...	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28 ...	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5 ...	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12 ...	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19 ...	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	0
" 26 ...	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2 ...	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9 ...	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16 ...	26	5	31	7			18	2	26	0			16	8	19	1		
" 23 ...	26	5	31	7			19	2	23	9			16	10	18	10		
" 30 ...	26	4	31	8			18	8	23	2			17	1	19	7		
July 7 ...	26	6	32	1			19	8	22	11			17	1	19	6		
" 14 ...	26	10	32	3			18	9	23	10			17	6	19	7		
" 21 ...	27	7	32	2			18	10	23	7			17	6	18	11		
" 28 ...	28	0	32	3			19	9	23	11			17	10	19	3		
Aug. 4 ...	28	3	31	11			19	9	22	0			17	10	18	4		
" 11 ...	28	4	30	5			19	9	22	5			17	7	16	11		
" 18 ...	28	8	28	5			22	5	23	4			16	7	16	4		
" 25 ...	29	5	27	1			23	2	23	6			16	5	15	9		
Sept. 1 ...	30	2	26	11			25	3	23	5			16	3	15	9		
" 8 ...	30	0	27	1			24	10	23	4			16	1	15	11		
" 15 ...	29	7	26	11			24	9	23	7			15	11	16	0		
" 22 ...	29	10	26	8			25	10	23	10			15	9	15	11		
" 29 ...	29	10	26	9			25	5	24	3			15	8	16	1		
Oct. 6 ...	30	2	26	9			25	6	24	9			15	9	16	3		
" 13 ...	30	5	26	11			25	4	24	10			15	8	16	6		
" 20 ...	30	4	27	1			25	5	25	0			15	11	16	7		
" 27 ...	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3 ...	30	6	27	10			25	0	24	9			16	0	17	1		
" 10 ...	30	3	28	3			24	6	24	10			15	11	17	4		
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	6	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of **Wheat, Barley, and Oats** per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: February ...	39 11	40 0	23 8	25 1	18 10	22 1
March ...	39 10	39 10	24 0	25 2	19 4	22 3
Paris: February ...	40 3	40 4	24 4	25 2	19 9	22 8
Belgium: March ...	30 10	30 3	23 8	24 6	20 6	21 5
April ...	30 8	30 6	23 10	24 7	20 5	21 7
Berlin: March ...	37 11	38 3	—	—	19 11	22 9
April ...	37 6	39 9	—	—	19 8	23 4
Breslau: March ...	{ 35 7	35 2	26 5	27 9 (brewing) 25 1 (other)	19 10	20 7
April ...	{ 35 7	35 8	26 5	27 9 (brewing) 25 1 (other)	19 8	21 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of **British Wheat, Barley, and Oats** at certain Markets during the Month of May, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	31 9	30 8	23 6	23 2	19 5	20 10
Norwich ...	31 0	30 1	24 10	25 6	17 8	19 4
Peterborough ...	30 5	29 10	22 9	22 5	18 3	19 5
Lincoln ...	29 9	29 7	22 0	23 0	18 1	19 11
Doncaster ...	29 1	28 11	28 2	23 9	17 6	19 4
Salisbury ...	30 7	30 3	22 2	22 4	18 7	20 5

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of May, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 6	11 6	—	—	—	—	14 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish ...	103 0	—	102 6	100 0	102 6	100 6	103 6	101 0
Danish ...	108 0	106 0	109 6	106 6	109 0	104 6	108 6	106 0
Russian ...	97 6	94 0	105 0	103 0	95 6	92 6	97 0	96 0
Australian ...	98 0	95 0	—	—	97 6	92 6	99 6	94 6
Argentine ...	100 6	96 6	97 0	95 6	97 6	94 6	98 0	—
CHEESE :—								
British, Cheddar	79 0	74 0	—	—	76 0	71 0	62 0	60 0
„ Cheshire	—	—	120 lb.	120 lb.	120 lb.	120 lb.	—	—
			65 0	60 0	60 0	65 0	—	—
Canadian ...	65 6	64 0	per cwt.	per cwt.	per cwt.	per cwt.	66 0	61 0
			63 6	62 6	64 0	60 6		
BACON :—								
Irish ...	67 6	63 6	68 0	64 6	68 0	63 6	—	—
Canadian ...	60 6	—	62 0	59 0	60 0	54 6	61 6	59 0
HAMS :—								
Cumberland ...	106 0	98 6	—	—	—	—	—	—
Irish ...	104 0	98 0	—	—	—	—	100 0	94 0
American (long cut) ...	58 6	58 0	57 0	54 0	57 6	54 6	57 0	53 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	10 0	8 9	—	—	—	—	—	—
Irish ...	8 5	—	7 7	7 2	7 4	6 10	7 3	6 9
Danish ...	8 10	8 1	8 11	7 1	8 6	8 0	8 2	7 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	65 0	58 0	—	—	75 0	70 0	49 0	45 0
Scottish Triumph... ..	65 0	55 0	58 6	49 6	56 6	51 6	—	—
Up-to-Date ...	80 0	62 0	64 6	54 0	56 6	50 0	40 0	35 0
HAY :—								
Clover... ..	94 6	83 6	101 0	91 6	96 0	75 6	88 0	78 0
Meadow ...	83 6	72 0	93 6	85 6	—	—	86 6	76 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	144	95	505	317
Swine Slaughtered as diseased or exposed to infection ...	773	372	2,581	1,510
Anthrax:—				
Outbreaks	97	85	430	446
Animals attacked	148	121	652	638
Glanders (including Farcy):—				
Outbreaks	95	107	456	499
Animals attacked	184	184	862	903
Sheep-Scab:—				
Outbreaks	10	26	278	631

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MAY.		5 MONTHS ENDED MAY.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	13	3	29	28
Swine Slaughtered as diseased or exposed to infection	177	20	437	329
Anthrax:—				
Outbreaks	—	—	2	2
Animals attacked	—	—	2	2
Glanders (including Farcy):—				
Outbreaks	1	—	3	9
Animals attacked	3	—	10	25
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	13	8	140	215

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BUTTER TESTS WITH SHORTHORN AND JERSEY COWS.

Between the years 1900 and 1904 a series of tests of considerable practical importance was conducted on the Experimental Farm of the Somerset County Council, situated at Bickenhall, near Taunton. The main results are here set out in the order in which the work naturally developed.

The first object in view was a comparison of Shorthorn and Jersey cattle as butter-producing cows. The milk of these two breeds has during recent years been the subject of frequent experiments at the meetings of the Bath and West of England Society, the British Dairy Farmers' Association, the Tring Agricultural Society, and at other places. The results obtained in this way, though valuable, are necessarily imperfect, since an agricultural show lasts at most for four or five days, whereas to settle the point at issue comparison is necessary extending possibly over some years, so that the effects of the unaccustomed surroundings in which cows find themselves at agricultural shows—surroundings which may affect the quality of their milk—may be eliminated, while at the same time those conditions arising from the season of the year, the difference in the period of lactation, the variations in food, which are met with in ordinary farming practice may have an opportunity of making themselves felt.

In starting the test ten pedigree Jersey cows were bought at sales in the county, while six non-pedigree Shorthorn cows were obtained from Westmorland. The numbers in the respective

herds were approximately the same throughout the whole period of the tests, the vacancies in the Jersey herd being filled by heifers bred on the farm, while the vacancies among the Shorthorns were made good either by the purchase of cows locally or by the drafting of home-bred heifers into the herd. Pure bred bulls of each breed were also purchased for use in the respective herds.

Throughout the experiment the cows were treated exactly alike as regards housing and the kind of food supplied. In winter they were tied up in the same byre, while in summer they ran on the same pastures. The only difference was in the quantity of food supplied to the two herds. It was found by actual periodical weighings that on the average the Shorthorns scaled roughly 50 per cent. more than the Jerseys, and in feeding the principle was adopted that cattle eat in proportion to their size. In all probability small cows eat relatively more than large ones, though individuals differ, but this principle was considered to be sufficiently near the mark to be adopted. In the matter of feeding, then, especially of concentrated foods, the Shorthorn cows were given 50 per cent. more food than the Jerseys. For winter feeding, carrots, cabbage, ensilage, and mangolds were all employed, while decorticated cotton cake in combination with maize meal or home-grown cereals was usually depended on as the concentrated food.

From November, 1900, till March, 1901, a series of monthly tests was made, but from April, 1901, till July, 1904, these tests were repeated at fortnightly intervals. In all eighty-six tests were conducted. The nature of each test was as follows:—On the selected day 50 lb. or 5 gallons of the milk of each breed was taken from the bulk after thoroughly mixing.* Each lot was then passed through the separator, and after the resultant cream had been set aside for two days, it was separately churned, and the amount of butter obtained was carefully determined. Knowing the amount of butter obtained from 50 lb. of milk, it is an easy matter to calculate the weight of milk required to produce 1 lb. of butter in each case. The

* From April, 1903, owing to other tests being conducted on the same days, less milk was available for the fortnightly tests, so 30 lb. of each milk was taken, and on one or two occasions the quantity was even less.

figure thus obtained represents what is known as the butter ratio, and this supplies us with a convenient standard for comparison of the butter-yielding capacity of the different milks. It would occupy too much space to give the whole of the figures obtained in these tests, but in the following table the highest, the lowest, and the average weight of milk in each year and over the whole period required to produce 1 lb. of butter are set out:—

Year.	No. of tests.	Pounds of Milk per lb. of Butter.					
		Shorthorn.			Jersey.		
		Highest.	Lowest.	Average.	Highest.	Lowest.	Average.
1900-1 ...	5	29'7	22'52	25'03	22'00	19'75	19'94
1901-2 ...	26	41'02	20'00	27'13	25'00	15'68	18'89
1902-3 ...	26	39'02	22'53	28'39	23'53	16'33	19'92
1903-4 ...	22	33'1	20'87	28'19	21'82	16'84	18'27
1904-5 ...	7	30'00	25'26	26'95	18'46	16'16	17'83
For the whole period	86	41'02	20'00	27'92	25'00	15'68	19'09

It will be seen that the ratios obtained vary very widely, the greatest variation, however, being exhibited by the Shorthorn milk, 20 lb. of the latter sufficing at one time to yield 1 lb. of butter, while at another time no less than 41 lb. were required. In the same way, something under 16 lb. of Jersey milk yielded 1 lb. of butter in November, 1902, while in August of the same year 25 lb. of milk were needed. Although some very poor ratios were obtained during the hot weather, when, ice or cold spring water not being available, a certain amount of butter may not have been recovered, generally speaking the worst ratios were obtained during the winter months when the cattle were indoors and living on artificial food. All recent work on the analysis of milk goes to show that the daily variation in composition, even when yielded by the same cow, is very marked, and it has hitherto been impossible wholly to explain such variations by reference to feeding or external conditions. Such variations chiefly affect the fat contents of the milk, and the figures obtained at Bickenhall bear out in a

striking manner the observations on such variation arrived at by chemical analysis. On the average we see that 19·09 lb. or a little under 2 gallons of Jersey milk, and 27·92 lb. or about $2\frac{3}{4}$ gallons of Shorthorn milk have been required to produce 1 lb. of butter.

The first question that arises is whether this has any practical application? Assuming the average price of butter to be 1s. per lb. all the year round, milk showing —

A butter ratio of 20 is worth 6d. per gallon.

„	„	25	„	4 $\frac{1}{2}$ d.	„
„	„	30	„	4d.	„
„	„	35	„	3 $\frac{3}{4}$ d.	„
„	„	40	„	3d.	„

These figures only take into account the value of the butter contents of the milk, the value of the separated milk not being included. Assuming the latter to be worth 1d. per gallon, that amount should be added to each of the above figures, the corrected amount thus representing the value for butter-making purposes of the above samples of milk.

We see that on the average 27·92 lb. or say $2\frac{3}{4}$ gallons of Shorthorn milk, and 19·09 lb. or a little under 2 gallons of Jersey milk were required to produce 1 lb. of butter. At the above price the value of the butter contents of the Shorthorn milk produced over the whole period is a little under $4\frac{1}{2}$ d. per gallon, plus 1d. for the buttermilk, or $5\frac{1}{2}$ d. per gallon in all, while the Jersey milk is worth $6\frac{1}{3}$ d. plus 1d. for buttermilk, or something over 7d. a gallon in all. As a matter of fact, we had a private connection for the sale of the butter at Bickenhall at a uniform price of 1s. 3d. per lb. On this basis the value of the average milk of the Shorthorns and Jerseys was $5\frac{1}{2}$ d. and just under 8d. per gallon respectively (not including the value of the separated milk). There is little doubt that where a Jersey herd is kept, or even where half the milk manipulated is, as at Bickenhall, from Jersey cattle, a better price can be obtained from private customers for the butter.

From observations of the mixed milks of Jersey and Shorthorn cattle made later, it was found that a ratio of 22 was obtained where the milks were mixed in equal proportions; that is to say, $2\frac{1}{2}$ gallons of mixed milk sufficed to produce 1 lb. of butter. The price per gallon actually realized for milk mixed

in such proportions was a little under 7d. per gallon without the separated milk, or 8d. including the latter.

If we turn to the condition of affairs existing on ordinary butter-making farms we find a very different state of things. There is little doubt that the Shorthorn milk at Bickenhall was of better quality than that from which butter is usually made, at any rate in the West of England, since the Bickenhall cows were better fed and better housed than is usually the case with the milking cows of Somerset. Generally speaking, we may assume that 3 gallons of the milk of ordinary cows is required to produce 1 lb. of butter; indeed, I have it from one of the largest factories in the county that such is the quantity of ordinary mixed milk required to produce 1 lb. of butter. Where butter is made from milk showing such a composition, and where, moreover, it is sold in the ordinary way, and realizes no more than 1s. per lb. on the average, we see that the price obtained for the milk is no more than 4d. a gallon, or 5d. allowing for the separated milk. It is little cause for wonder, then, that butter-making should be regarded as the most unprofitable branch of British dairying, though we must remember that it is always combined with the rearing of stock, and that part of the profits of the operation must be looked for in that direction. One point, at any rate, is clearly brought out by these figures, and that is the importance where butter is made of the milk being good in quality. Where the milk is being sold for consumption, quantity is a factor of importance and must be taken into consideration. A reference to the table given above shows that the difference between the butter ratio of 20 and 30 is no less than 2d. a gallon where the butter is sold at 1s. per lb., and there is no doubt that on butter-making farms more attention should be paid to the selection of cows which give milk rich in quality as well as abundant in quantity, and that a serious attempt should be made, by careful selection and breeding, to build up a herd in which this characteristic is strongly marked.

Turning to another aspect of the question, the following table shows the amount of milk taken and the butter obtained in eighty-one tests during the four seasons 1901 to 1904 inclusive:—

Year.	No. of tests.	Milk taken.	Butter obtained.			
			Shorthorn.		Jersey.	
			Lb.	ozs.	Lb.	ozs.
1901-2 ...	26	130 galls.	47	12 $\frac{1}{2}$	68	12 $\frac{3}{4}$
1902-3 ...	26	130 „	46	13 $\frac{1}{4}$	65	11 $\frac{1}{4}$
1903-4 ...	22	62 $\frac{1}{2}$ „	22	8 $\frac{1}{2}$	34	5 $\frac{1}{2}$
1904-5 ...	7	21 „	7	13	11	12
	81	343 $\frac{1}{2}$ galls.	124	15 $\frac{3}{4}$	180	9 $\frac{1}{2}$

From this we see that from 343 $\frac{1}{2}$ gallons of Shorthorn and of Jersey milk, 125 lb. and 180 $\frac{1}{2}$ lb. of butter were respectively obtained. In the latter case 55 lb. more butter is obtained than in the former, or an increase of 44 per cent. On the face of it, therefore, it would appear that the Jersey is by far the more profitable cow to keep for butter-making, and this is a point which merits close attention. The following table shows the average live weight, the milk yield, the butter ratio, and the yield of butter for both breeds of cows during the period of the experiment :—

—	Shorthorn.	Jersey.
Average live weight	1,325 lb.	865 lb.
„ milk yield	650 galls.	500 galls.
„ butter ratio	27·92	19·09
„ yield of butter	233 lb.	262 lb.
Yield of butter per 1,000 live weight	176 lb.	303 lb.

The yield of butter per cow is a calculated figure, and it is obtained by assuming that the average yield would in each case show the average butter ratio. We see, then, that the return in butter from the Jerseys is no less than 29 lb. per cow greater than that from the Shorthorns, and since three Jerseys can be kept on as much ground as two Shorthorns, the keeping of the former breed would appear to be a most profitable undertaking. Each Shorthorn would undoubtedly consume more food to produce 233 lb. of butter than would each Jersey to produce 262 lb. It was stated at the outset that in the feeding of the cattle we worked on the assumption that the Shorthorns were half as heavy again as the Jerseys. As a matter of fact they were more than 50 per cent. heavier. In any case they received

50 per cent. more food, and in order to arrive at a fair comparison of the return in butter for the consumption of a given weight of food when given to Shorthorns and Jerseys respectively we must reduce the yield of butter to some convenient standard of comparison. One thousand pounds live weight suggests itself as such a standard, and the yield of butter has in each case been reduced to these terms. We then find that the Shorthorns yielded 176 lb. and the Jerseys 303 lb. of butter per 1,000 lb. live weight, or, in other words, for equal quantities of food consumed, the advantage in favour of the Jerseys amounts to no less than 127 lb.; or, putting it another way, for equal consumption of food, the Jerseys produce 72 per cent. more butter than do the Shorthorns. This, however, does not represent the whole of the advantages in favour of the Jerseys, since the quality of the butter made from their milk is very superior to that made from Shorthorn milk, and it would at any time fetch at least 1d. or 2d. per lb. more.

If this represented the whole of the question, every fair-minded man would be compelled to admit that where butter-making is the object in view the Jersey should be preferred to the Shorthorn, and there is not the slightest doubt that while she is in profit the smaller animal is immeasurably superior. Other considerations have, however, to be taken into account, but unfortunately it was not found possible to deal with these without keeping the two herds entirely separate and distinct in every way, and this was not practicable. The first objection to the Jerseys—and this was a fatal one at Bickenhall—is their delicacy of constitution. It is to be expected that a breed of cattle which have been in-bred for so many generations and which are constantly denuding themselves of their fat to put it in the pail should not possess the robustness of constitution which less closely in-bred or highly specialized cattle possess. It is a matter of common experience that the deepest-milking cows of any breed carry least flesh, and are most likely to go wrong. It seems inevitable, therefore, that so long as the characteristics of the Jersey breed remain what they are, they should, except in the most favourable situations, exhibit this delicacy of constitution. Be that as it may, our losses at Bickenhall were serious, no fewer than two cows per annum on the average succumbing to tuberculosis or milk fever, to both of which diseases

the Jerseys seemed especially prone. The greater number succumbed to tuberculosis of the intestines. During the same time one Shorthorn cow only had to be got rid of as unsound. Another objection to the Jerseys is the well known one of the loss of carcase value on death. It is true that while she is in profit the Jersey as a butter-maker will give a considerably higher return than the Shorthorn, but when her days of usefulness in this direction are ended, or when from abortion or udder troubles she has to be discarded, it is impossible to convert her into a saleable carcase of beef, and our experience at Bickenhall was that the Jerseys realized no more than from a quarter to a half of what a Shorthorn or cross-bred cow would fetch when fat. A further source of loss is met with in the disposal of the bull calves. In a strictly pedigree herd, where such are reared for stock purposes, this loss would not be felt, but under the ordinary conditions of farming the birth of Jersey bull calves is little short of a calamity, since they are useless for castrating with a view to rearing and fattening. The heifers can, of course, be reared for the dairy, but the bull calves must be sold for what they will fetch. At Bickenhall we were able to sell them for 2s. 6d. a head newly dropped, or sometimes for as much as £1 each at one month old. In one season we were particularly unfortunate in the matter of the number of bull calves born, no fewer than nine of the twelve Jersey calves being bulls. If instead of being sold for a few shillings a head these calves had been Devons or Shorthorns and worth say 30s. per head when dropped, or if they had been castrated and worth £7 or £8 per head at the end of twelve months, the effect on our balance sheet would have been appreciable. For these reasons, therefore, and in spite of the fact that the Jersey cattle kept at Bickenhall gave a really fine yield of butter, they could not be pronounced profitable, for the extra return which they gave in butter was more than eaten up by the losses from deaths, barrenness, birth of bull calves, and so on. Where, however, the climate and situation are such as to suit the breed so that the most serious objection, namely, that arising from their delicacy of constitution, is removed, and where moreover butter and cream command a good price, the keeping of Jerseys, if good of their kind, would appear to be a most profitable undertaking.

J. H. BURTON.

ARTIFICIAL INCUBATION.

With the object of securing further data as to the artificial hatching of chickens, the observations made at the Reading College Poultry Farm, Theale, have been continued during the past twelve months. The records of the two previous years were given in the *Journal* of the Board of Agriculture, June, 1904 (p. 135), and May, 1905 (p. 87). For comparison with the present report the complete observations are tabulated in a later paragraph. The work was carried out in the specially built incubator house previously described, and under favourable conditions as to equability of temperature and ventilation. It is, however, necessary to note that the machines are operated by students under the supervision of the practical instructors.

The conditions under which incubators are worked is an essential factor in the attainment of a successful result. Where several machines are at work the combustion of burning lamps affects the atmosphere to a very large degree, not only drying the air, but exhausting the oxygen which is essential to the growing embryos. Unless, therefore, provision is made for a regular and sufficient supply of pure air, not only will the lamps burn badly, but the hatching results will be adversely affected. As we have had fourteen lamps burning, and nearly 1,800 eggs undergoing the process of incubation at one time, the importance of fresh air is manifest. In addition, the changes of temperature must be taken into account. No incubator can automatically provide for excessive variations. By minimizing these the strain upon the regulating apparatus is greatly reduced, and the atmospheric influences in the egg chambers are favourable. Rapid rise or fall in excess cannot fail to cause undue or insufficient heat. Even the most perfect regulator can only work within its limitations. Diagram I. shows these variations both in temperature and humidity, from which it is apparent, as proved in the previous years, that in this country a well built and ventilated incubator house, above ground and favourably situated, will minimize extremes both of heat and cold, while the atmosphere will contain a sufficient supply of moisture. It is interesting to note the evenness of the temperature in the incubator room. On one occasion a maximum of 83 deg. F. was registered—4 deg. F. above the highest point of the previous

year, when the outside temperature was 90 deg. F.—but in no case did the air in the room fall below 41 deg. F. To this fact must be attributed much of the success attained. As seen by Diagram II., the lowest percentage of hatching was in August, 1905 (64·68), when the variations of room temperature were at their narrowest (77 deg. F. max. to 62 deg. F. min.), which

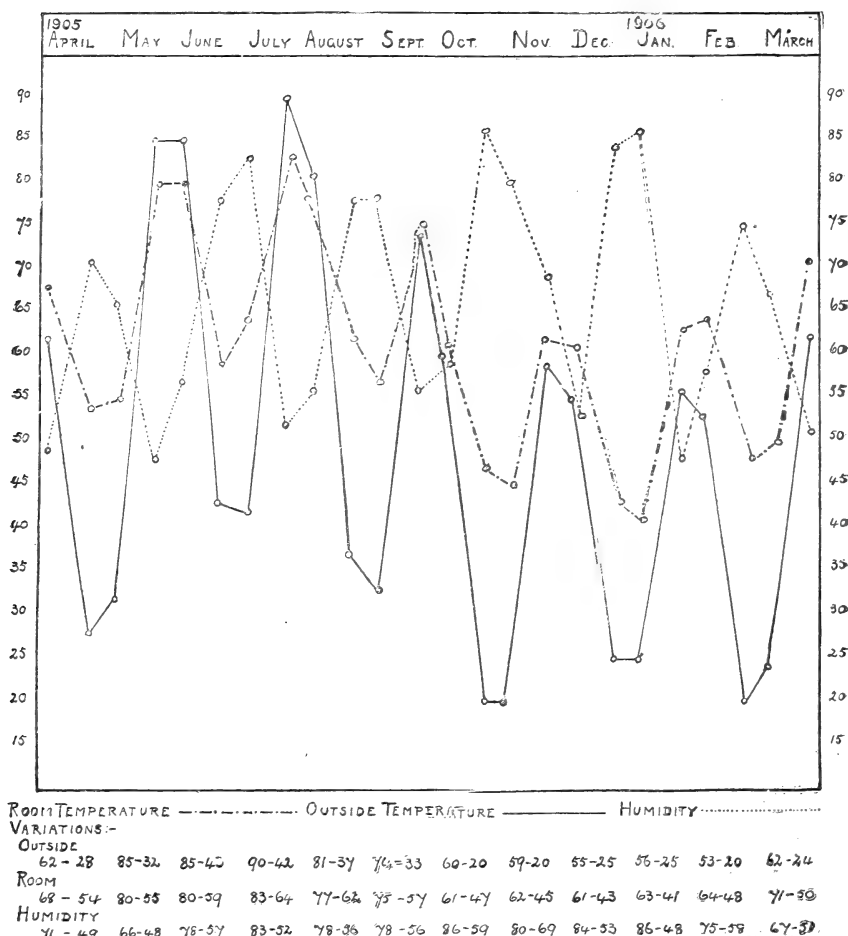


FIG. 1.—VARIATIONS OF TEMPERATURE AND HUMIDITY IN THE INCUBATOR HOUSE.

might suggest that warm nights are less favourable than cool; but this is not borne out by the second lowest percentage month, February, 1906 (66·41), for then the temperature was much below, ranging from 69 deg. F. to 50 deg. F. In the highest month, September, 1905 (83·47 per cent.) the variations were from 75 deg. F. to 57 deg. F. We must look in other

directions for explanation of these differences. A wet and dry bulb hygrometer is used, by which the temperature of the room is recorded, with the saturation point (100 deg.); and the humidity is calculated by means of Glaisher's hygrometrical tables.

In the two previous years three leading makes of incubators were used, but this year three others have been added, so that the observations are in that respect more complete. Those operated were as follows:—A, Hearson's Champion; B, Tamlin's Nonpareil; C, Cypher's Standard; D, Tamlin's Imperial; E, Chas. Cypher's Model; and F, Draper's J.M.D. Of these A, B, and F are tank machines, C, D, and E are on the hot-air, non-moisture principle. These three latter, although differing in minor details, are practically of the same type. But in respect to the C form, we have used this year a larger size than previously, namely, one holding 360 eggs, and, as is seen in Table I., the results have been most satisfactory, giving a percentage of 76·52, which is above the general average. These incubators were not, however, filled to the extent of their capacity, Table I. gives the record of each hatching in the entire twelve months, showing (1) number of eggs placed in the machine, (2) number of fertile eggs as revealed by testing on the seventh day, (3) number of chickens hatched, and (4) percentage of fertile eggs hatched.

During the twelve months under review the number of hatchings was 89, or 21 more than in the previous year. Into the machines were placed 7,790 eggs; of these 6,330 proved to be fertile, a percentage of 81·13, so that the fertility was 0·98 per cent. higher than in 1904-5; the chickens and

TABLE I.—HATCHING RECORDS.

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs, 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
1905.					Percentage.
April 3	C	114	94	56	59·37
" 3	A	95	72	59	81·94
" 3	C	90	79	64	75·95
" 5	A	62	54	46	85·18
" 12	B	53	40	33	82·5
" 14	C	225	208	167	80·29
" 17	A	48	42	33	78·57
" 17	C	110	85	57	67·06
" 26	C	122	96	81	84·37
" 26	B	98	84	71	84·52
" 26	A	95	89	70	78·65
" 28	A	50	42	37	88·1

TABLE I.—HATCHING RECORDS—*Continued.*

Date of Hatching.	Class of Machine.	No. of Eggs.	No. of Fertile Eggs, 7th day.	No. of Chickens Hatched.	Fertile Eggs Hatched.
					Percentage.
1905.					
May 4	B	54	50	42	84.0
" 6	C	201	184	133	72.23
" 9	D	100	85	56	65.88
" 9	A	95	89	70	78.65
" 12	C	117	103	69	66.99
" 16	A	*41	34	23	67.65
" 21	C	90	83	70	84.33
" 22	C	114	92	81	88.06
" 22	A	53	49	46	93.87
" 22	A	97	89	75	84.27
" 24	F	103	94	75	79.78
" 30	C	117	107	71	66.35
June 1	B	100	68	57	83.8
" 1	D	111	99	50	50.5
" 6	C	121	99	60	60.6
" 14	A	98	93	79	84.94
" 14	B	100	81	65	80.24
" 16	A	50	39	19	48.71
" 21	F	100	92	32	34.78
" 25	B	94	70	45	64.28
" 26	D	59	52	38	73.07
" 26	B	103	74	59	79.59
July 6	C	123	102	72	70.59
" 10	B	66	58	26	44.82
" 18	C	196	181	158	87.3
" 28	A	50	29	24	82.76
" 28	B	48	47	36	76.6
Aug. 3	C	50	43	29	67.44
" 3	B	40	32	25	78.12
" 3	F	50	40	32	80.0
" 7	A	40	33	29	87.87
" 11	A	50	36	17	47.22
" 15	B	60	32	23	71.87
" 23	B	84	70	48	68.57
" 26	C	233	150	78	52.0
Sept. 13	C	118	105	81	77.14
" 20	B	87	63	51	80.95
" 27	A	80	74	70	94.59
Oct. 4	A	52	47	41	87.23
" 13	C	85	62	37	59.67
Nov. 3	A	42	42	30	71.43
" 14	C	48	46	37	80.43
" 21	E	24	22	16	72.72
Dec. 12	D	24	21	18	85.71
" 12	B	24	16	12	75.0
" 12	C	42	26	21	80.77
" 12	A	24	16	13	81.25
" 23	E	80	55	42	76.36
" 30	D	46	40	33	80.25
1906.					
Jan. 9	A	32	22	20	90.9
" 11	B	44	40	31	77.5
" 19	E	71	66	49	74.24
" 24	C	77	52	35	67.3
Feb. 1	A	56	33	24	72.72
" 4	A	61	41	23	57.0
" 9	D	86	76	56	73.68
" 13	C	107	75	42	56.0
" 16	C	148	74	46	62.16
" 21	E	111	70	49	70.0
" 24	A	56	39	26	66.66
" 28	C	318	241	165	68.46
Mar. 2	A	100	66	28	46.66
" 3	B	*30	18	15	83.35
" 6	A	52	44	37	84.09
" 6	B	87	65	44	68.59
" 7	D	115	85	63	74.12
" 9	C	109	100	61	64.0
" 13	C	200	159	118	74.21
" 14	C	109	103	76	73.79
" 20	A	49	39	34	87.18
" 20	C	203	184	133	72.28
" 25	E	*58	35	26	74.28
" 25	B	*41	29	22	75.86
" 27	A	85	79	52	65.82
" 30	A	50	42	35	83.33
" 30	B	84	70	59	84.28
" 31	B	104	84	71	84.52

* Duck Eggs.

ducklings hatched numbered 4,631, a percentage of 73·16, or 2·66 per cent. less than in the previous year, but 3·16 per cent. above the average for 1903-4. The season was thus not quite so favourable as in 1904-5, yet such an average will be regarded by poultry breeders as satisfactory, for hatchings took place in every month of the twelve. As shown by Table II. and Diagram II., fertility was highest in November, 1905, and lowest in February, 1906, whilst hatching results were highest in September, 1905, and lowest in August, 1905. From these results no definite data can be obtained, except that with an increased number of hatchings the tendency to a lower average will be manifest, especially if more machines are worked in the same building.

TABLE II.—FERTILITY OF EGGS.

Month.	No. of Hatches.	No. of Eggs.	No. Fertile.	Percentage of Fertility.	Percentage of Fertile Eggs Hatched.
1905.					
April	12	1,163	985	84·68	78·57
May... ..	12	1,182	1,059	89·59	76·58
June... ..	10	936	767	81·94	67·53
July	5	483	417	86·33	75·78
August	8	607	436	71·18	64·68
September	3	285	242	84·91	83·47
October	2	137	109	79·56	71·56
November	3	114	110	96·49	75·45
December	6	240	174	72·5	79·88
1906.					
January	4	224	180	80·35	75·0
February	8	943	649	68·82	66·41
March	16	1,476	1,202	81·16	72·96

The highest and lowest percentages of fertile eggs hatched by each class of machine during the twelve months were as follows :—

Class of Machine.	Percentage of Fertile Eggs Hatched.	
	Highest.	Lowest.
A	94·59	46·66
B	84·52	44·82
C	88·06	52·0
D	85·71	50·5
E	76·36	70·0
F	80·0	34·78

A comparison with the previous year indicates that no incubator reached the record of 1904-5 (96·82), whilst in each of the three

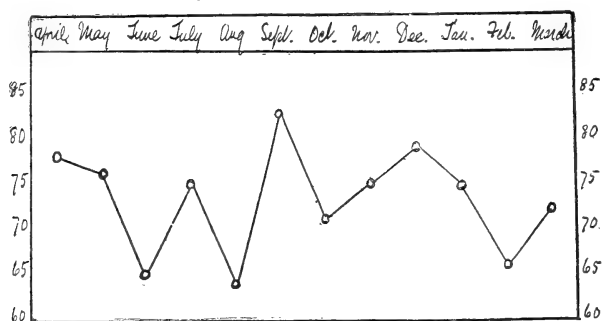


FIG. 2.—MONTHLY PERCENTAGES OF FERTILE EGGS HATCHED.

classes worked that year much lower percentages were made in 1905-6.

In the previous twelve months the highest percentage of hatches in any one month was in October, 1904 (87·61), and the lowest was in May of the same year (70·17). From Diagram II. it will be seen that the highest monthly percentage during the year under review was in September, 1905

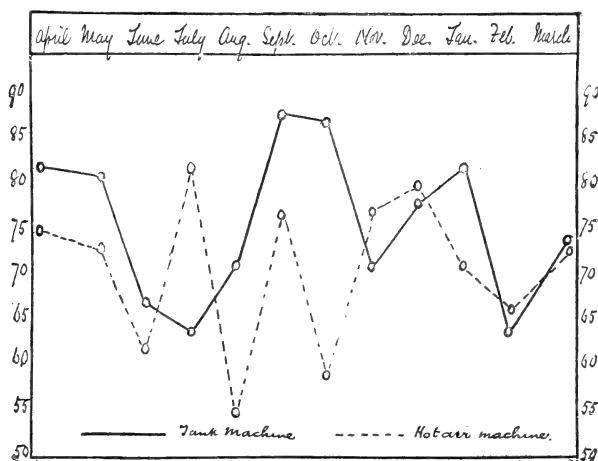


FIG. 3.—MONTHLY PERCENTAGES OF HATCHINGS IN TANK AND HOT-AIR MACHINES.

(83·47), and the lowest in August, 1905 (64·68). The monthly variations were much greater than in 1904-5.

It is remarkable that working with the same machines under identical conditions results vary so greatly. Table III. gives the highest and lowest percentages for each month. Working

with fourteen incubators of six different makes there are differences in the individual machines which to some extent may account for these variations, as, for instance, when one class is both highest and lowest in the same months. Comparisons would be more correct if the same number of machines of each class were recorded and only those used during the entire year. Such a comparison would, however, need special arrangements, and the object of these observations is to show what can be done by working in the regular manner. No doubt similar variations would be found if all the fourteen incubators had been of one class and size. A careful examination of the records of each machine, which would be very lengthy to give in detail, has not yielded any explanation of the changes recorded.

TABLE III.—HIGHEST AND LOWEST PERCENTAGES FOR EACH MONTH.

Month.	Class of Machine.	Highest Hatching Percentages.	Class of Machine.	Lowest Hatching Percentages.	Percentage of Hatching in each Class of Machine.	
					Tank.	Hot Air.
1905.						
April ...	A	88.1	C	59.57	82.5	75.62
May ...	A	93.87	D	65.88	81.72	73.39
June ...	A	84.94	F	34.78	67.67	62.13
July ...	C	87.3	B	44.82	64.18	82.12
August ...	A	87.87	A	47.22	71.61	55.44
Sept. ...	A	94.59	C	77.14	88.32	77.14
Oct. ...	A	87.23	C	59.67	87.23	59.67
Nov. ...	C	80.43	A	71.43	71.43	77.94
Dec. ...	D	85.71	B	75.0	78.12	80.28
1906.						
Jan. ...	A	90.9	C	67.3	82.25	71.18
Feb. ...	D	73.68	C	56.0	64.6	66.79
March ...	A	87.18	A	46.66	74.06	73.57

The monthly percentages of hatching results for tank (A, B, and F), and hot-air (C, D, and E) incubators respectively are also indicated in the above table, from which it will be seen that in April, May, June, August, September, October, 1905, January and March, 1906, the tank machines gave the highest results; and that in July, November, December, 1905, and February, 1906, the hot-air machines were in advance. The totals for the entire twelve months were: tank machines (49 hatches) yielded 75.42 per cent. (2,013 chickens and duck-

lings out of 2,669 fertile eggs); and hot-air machines (40 hatches) yielded 71.51 per cent. (2,618 chickens and ducklings out of 3,661 fertile eggs). By these figures the greater capacity of the latter will be apparent.

Taking the different types of machines operated during the period, Table IV. gives the comparative results, and, it is interesting to note, with the exception of one (F), the close approximation between the various tank and hot-air incubators respectively. It will be seen that in Class C more birds were hatched than in A, B, and D combined, due to the fact that whilst in the latter all are of 50 to 120-egg capacity, the smallest of the former is for 120 eggs, ranging up to 220 and 360.

TABLE IV.—INCUBATOR RESULTS.

Class of Machine.	No. of Hatches.	No. of Fertile Eggs.	No. of Chickens Hatched.	Percentage of Fertile Eggs Hatched.
A	27	1,374	1,060	77.14
B	20	1,069	814	76.14
C	27	2,933	2,101	71.63
D	7	480	335	69.79
E	5	248	182	73.38
F	3	226	139	61.06

The question is frequently asked, apart from the class of incubator, whether one size gives better results than another? Smaller poultry-keepers naturally prefer those with a modest capacity, and would rather have four holding 50 eggs each than one of 200, as the former can be filled and started whilst the eggs are fresh, and there is not the same loss of power as when a big machine is only partly filled. The figures shown in Table V. give the comparisons. It is surprising to find that whilst the smallest sized incubators (50 eggs) have given the best results, the second best is the largest of all (360 eggs), and the lowest place is taken by the 220-egg size. It is true that the 360-egg size was only partly filled on the two occasions it was operated, but that is equally correct with the 220-egg size, for during the eight times these were operated, on one occasion alone had they more than 200 fertile eggs. If the general experience were that the smallest size of incubator gave such high results over 26 hatchings as 79.48, the gain

would more than compensate the additional first cost and labour in working.

TABLE V.—COMPARATIVE RESULTS OF VARIOUS SIZES OF INCUBATORS.

Egg Capacity.	Class of Machine.	No. of Hatches.	No. of Fertile Eggs.	No. of Chickens Hatched.	Percentage of Fertile Eggs Hatched.
50... ..	A, B	26	970	771	79.48
100... ..	A, B, F	23	1,615	1,171	71.27
120... ..	C, D, E	30	2,152	1,539	71.51
220... ..	C	8	1,171	827	70.62
360... ..	C	2	422	323	76.52

During the year careful records have been kept of the results from hatching in the natural manner. Twenty-eight such hatchings took place, fifteen from April to July, 1905, one in February, and twelve in March, 1906. Three hundred and fifty-three eggs in all were placed under the hens, and of these 282 proved to be fertile (79.88 per cent.), and 223 chickens and ducklings were hatched, or 79.07 per cent. If these figures are compared with the results obtained from the machines it will be seen that the result was 5.91 per cent. above the average obtained in the machines, and is to that extent in favour of the hen. But natural hatching took place during only six months of the year; so that apart from the difficulty of securing broody hens when required and in sufficient numbers (to hatch 4,631 chickens about 500 hens would be required), the gain is not so great as might have been anticipated.

Hens may be used when available, but could not be relied upon to the same extent as incubators. It may be explained that the twenty-eight hens set do not represent all that were engaged in maternal duties during the twelve months. Many of the hens are allowed to sit for a few days on dummy eggs, when they are provided with a batch of chickens from the incubators, which they rear in the natural manner. This simplifies the work and gives the hens a change or rest.

The present series of observations, extending over three years, may be fitly brought to a conclusion by tabulating the results arrived at in each of the twelve months, so that they may be compared.

SUMMARY OF RESULTS AND OBSERVATIONS.

(Three years ending March 31st, 1906.)

----	1903-4.	1904-5.	1905-6.
No. of hatches	62	68	89
„ eggs placed in machines	4,590	5,881	7,790
„ fertile eggs	3,674	4,714	6,330
„ chickens, &c., hatched	2,572	3,574	4,631
Percentages of fertility	79.6	80.15	81.13
„ hatches of fertile eggs	70.0	75.82	73.16
Highest hatching percentages... ..	92.3	96.82	94.59
Lowest „ „ „ „ „ ..	50.0	56.52	34.78
Highest monthly hatching percentages	81.12	87.61	88.32
Lowest „ „ „ „ „ ..	67.94	70.17	55.44
Tank, incubators hatching percentages	70.89	78.2	75.42
Hot-air „ „ „ „ „ ..	68.95	73.64	71.51

The points which these extended observations bear out are, (1) that under suitable conditions incubators can be relied upon to give an average of more than 70.0 of chickens and ducklings from fertile eggs (the average for the three years is 73.22); and (2) that incubators can be operated successfully all the year round.

EDWARD BROWN.

DEVONSHIRE CREAM AND SOFT CHEESE
MAKING.

A plethora of milk exists in many parts of the country during the summer months, and frequently very low prices have to be accepted for it from the wholesale dealers. Any means of diverting the surplus supply into more profitable channels will tend to raise the value of the bulk of the yield.

It must be remembered that both cream and soft cheese are regarded as luxuries by the majority of people, and are therefore only bought occasionally. Consequently, it is advisable to place on the market small quantities at a time, and to fix the price at a moderate figure. The best demand is to be found at seaside and country health resorts, where fresh farm-house produce, properly made and packed, commands a ready sale from visitors during the warm weather. No great outlay is required for soft cheese making, and even small quantities of milk may advantageously be used in this way. The sorts described below are among the easiest to make.

Accommodation.—The room used for cheese making should be one in which the temperature can be controlled to some extent. A temperature of from 62 deg. to 65 deg. F. in summer and winter respectively is desirable, as too much heat produces too rapid drainage of the curd, and too low a temperature results in a wrongly fermented cheese.

Milk.—A pure rich milk gives the finest cheese. It is not possible to produce first-class cheese from stale or acid milk, as the curd drains too rapidly. In some varieties of cheese the curd is cut or sliced in large pieces, the object being to retain much of the moisture; the smaller the curd is cut the more rapidly the whey drains off.

Rennet.—This is a substance which contains a chemical ferment having the power of coagulating milk. When milk coagulates the casein is precipitated, and the fat becomes mechanically entangled in it, the whole forming the curd. Reliable rennet solutions of a very concentrated nature can readily be purchased, and are usually employed, after dilution with cold water, in the manufacture of soft cheese. Rennet solutions should be kept in a dark, cool place, preferably in stone bottles, as the light weakens the action of the ferment. When of good quality rennet is clear, of a light straw colour and nearly odourless. Rennet in the form of powders and tabloids is often used. For hot climates and where rennet is only occasionally required, the tabloids are preferable to the liquid rennet, as they are always of uniform strength and do not deteriorate when kept.

Appliances.—Wooden tubs fitted with lids, though not essential, are a great convenience. Wood is a bad conductor of heat, and is therefore most useful in maintaining the milk at an even temperature during coagulation. A falling temperature causes the cream to rise, involving much loss of butter-fat in the process of cutting the curd. Oak is preferable on account of its hardness and close texture, and it is most readily cleansed after use. In very cold or hot weather an earthenware or tin vessel containing the milk may be set within a large wooden tub containing water, which is heated or cooled according to the temperature at which it is desired to maintain the milk during coagulation. This varies in different varieties of cheese.

A measuring glass or pipette is necessary to ensure accuracy

in measuring out the rennet for use. One marked in cubic-centimeters (c.c.), sub-divided into ten parts, is the simplest form of measuring instrument to use. The comparative measures are as follows :—

3.55 c.c. (or, roughly, 3.5 c.c.)	...	...	...	=	1 dram.
1 c.c.	...	...	...	=	17 minims.
60 minims or drops	...	...	...	=	1 dram.
8 drams	...	...	...	=	1 ounce.

The draining table should have a slightly sloping surface, and be provided with grooved channels for the whey to run off. Hard wood or slate is a good material for the table top.

A metal scoop or spoon for cutting the curd is also required, as well as moulds, which are usually made of tin, but sometimes of wood. These can be bought at a low price, according to the variety of the cheese.

The cloths required for draining the cream should be of fine, medium, and coarse texture. They are made of bleached linen, the finest quality of which costs about 1s. 6d. a yard.

Among the other articles which will be wanted are boards 14 in. by 8 in. by $\frac{1}{2}$ in. in thickness, which should be made of hard wood, of such a nature that it will not impart any flavour to the cheese; straw mats, which can be purchased or made at home by threading together coarse wheat or rye straw; grease-proof paper, cut to a suitable shape for the particular variety of cheese; a wall thermometer to record the heat of the making room; and a floating thermometer (that has been accurately graduated) for use with the milk and curd.

The salt used should be pure, free from grittiness, and readily soluble.

Varieties of Cream Cheese.—Cream cheese may be made of two different qualities, (1) made from double or very thick rich cream, (2) made from thin cream, or cream to which a portion of milk is added.

Double Cream Cheese.—For the manufacture of this cheese thick cream is necessary. If the milk is separated, the separator should be regulated so that the milk yields 6 to 8 per cent. cream; or, in other words, 6 to 8 lb. of cream from every 100 lb. (roughly, 10 gallons) of milk passed through the separator. The cream as obtained from the separator should be cooled to 60 deg. F. in summer, and 65 deg. F. in winter,

and then placed in a fine-textured linen cloth, previously rendered sweet and clean by thorough scalding with boiling water. Sweet shallow-pan cream may of course be used, and is treated in a similar manner. The cloth is best laid in a basin, and the cream poured into it, then the four corners are taken and tied together, so that the cloth resembles a bag containing the cream. It is better not to put more than 1 gallon of cream in the cloth, as drainage is not easy with more than this quantity, and the cheese is apt to become too sour. The bag of cream should be hung up in a cool dry place to drain. Three times a day the cloth ought to be opened out and the sides scraped to remove the stiffened cream in order to facilitate drainage. At the second scraping down the cream should be transferred into a fresh cloth. It is sufficient if the cloth is changed once only, though if done more frequently rather better results are obtained. The cream will be sufficiently drained in about two days, but the process may be accelerated by opening out the cloth and scraping down frequently, and by placing a small weighted board on the cloth containing the cheese. When the cheese becomes of a stiff pasty consistency it should be emptied out of the cloth, and a small quantity of fine salt mixed with it preparatory to moulding; this will bring out the flavour and assist the keeping properties of the cheese. It is customary in some cases to salt the cream, instead of the actual cheese. The cheeses are turned out in square, oblong, round, heart-shaped, and other forms, according to the type of mould used. They may either be done up in grease-proof paper and placed in small cardboard boxes, or the curd may be done up in butter muslin and afterwards wrapped in grease-proof paper, in which case no box is necessary. The cheese sold retail at sixpence is usually of about four ounces weight, and a gallon of rich cream should make about sixteen cheeses.

Ordinary Cream Cheese.—This is prepared from thin cream taken from the separator at the rate of 12 per cent, or from cream to which milk has been added. It should be cooled to 60 deg. or 65 deg. F., and 1 c.c. of rennet added to each $\frac{1}{2}$ gallon of cream. It should be allowed to stand for about twelve hours to thicken, and then ladled into cloths and treated in a similar manner to double cream cheese. This variety of

cream cheese contains a much greater portion of curd, and is not nearly so rich as the double cream cheese.

Gervais.—This is a popular variety of French cheese, made from a mixture of whole milk and cream, in the proportion of two to one. The Gervais is a small cheese, measuring about $2\frac{3}{4}$ in. high by $1\frac{3}{4}$ in., and may be consumed either fresh or when of some age. The moulds for this variety of cheese really consist of twelve small moulds fixed on one base. To produce twelve cheeses two quarts of warm new milk and one quart of cream should be mixed together by constantly stirring for at least ten minutes. The temperature of the mixture should then be regulated to 60-65 deg. F., and 1 c.c. of rennet (diluted with a little cold water) should be added. Provision should be made to keep the temperature uniform whilst the curd is being produced. This will take about twelve hours, when the curd may be ladled into a draining cloth of a suitable degree of coarseness and hung up to drain as in the case of cream cheese. It should be treated in a similar manner to cream cheese as regards scraping &c., and when sufficiently firm should be salted preparatory to moulding. The moulds should be lined with strips of blotting-paper, a special variety of which is made for this kind of cheese, and then set on a straw mat placed on a board. The moulds should be carefully filled with the curd by means of a bone knife. The curd should be left in the moulds for a short time until the cheeses have become of settled shape, when the moulds may be removed.

Devonshire Clotted or Scalded Cream.—Though originally confined to the counties of Cornwall and Devon, the manufacture of clotted cream is now carried out most successfully in practically all counties. In addition to its having gained a great reputation as a luxury, it is now largely recommended by the medical profession as an excellent fatty food, and is displacing to some extent the use of cod liver oil amongst invalids. Devonshire cream is very rich, containing from 50 per cent. to over 60 per cent. of fat, and this fat is of a more digestible kind than any other, being present in the cream in a finely emulsified condition. In the preparation of clotted cream it is desirable to have rich milk, such as is produced from the Channel Island breeds of cattle, but this is not essential, and

the evening's milk from Shorthorn cows will produce very good cream indeed.

The cream is prepared as follows :—

1. Whole milk, warm from the cow, is carefully strained into setting pans. The pans most suitable for the purpose hold about six quarts of milk, measuring 15 in. across the top, 7 in. in depth, and 11 in. across the bottom ; they are, in fact, similar to "shallow pans," only deeper.

2. The pans of milk are left undisturbed in a cool dairy for the cream to rise. In summer, twelve hours or less is the time allowed, but in winter twenty-four hours is usual.

3. The pans should now be carefully removed and scalded, great care being taken not to disturb the cream on the top of the milk. Scalding is carried out by placing the pans on a hot-water stove, and allowing steam to play upon them until in not less than half an hour's time they have attained a temperature of 175 deg. to 180 deg. F., when they are removed, and either allowed to cool naturally, or are cooled by placing them in a stream of cold running water. The scalding should not be done too quickly, or otherwise the characteristic scald flavour is not produced. The heating may be carried out by placing the pans on a kitchen range or hob, but the hot-water method is preferable.

4. When cold the cream may be taken off from the pans in a thick clotted condition, and is ready for sale. In summer time particularly it is most advisable to cool the pans as quickly as possible after scalding, as this ensures extra keeping properties.

The cream is generally sold by the pound. One pound of cream may be obtained from $1\frac{1}{2}$ gallons of Jersey milk, or less ; whereas, nearly 2 gallons of Shorthorn milk may be required to produce the same quantity of cream.

C. W. WALKER-TISDALE and

T. R. ROBINSON.

EXPERIMENTS WITH CALCIUM CYANAMIDE.

Calcium cyanamide,* or "Kalkstickstoff," the new manure obtained by combining calcium carbide with the nitrogen of the atmosphere, seems likely soon to come upon the market on a commercial scale. Through the kindness of the *Cyanid Gesellschaft* of Berlin, a trial quantity was received by the Rothamsted Experimental Station in 1905, and was used for barley and mangels, with the results set out below. The material was a fine black powder, which yielded on analysis 20·3 per cent. of nitrogen; it is thus weight for weight only a trifle poorer in nitrogen than sulphate of ammonia, which contains about 20·5 per cent. In all cases it was compared with sulphate of ammonia; phosphates and potash being applied equally on both the trial plots so as to provide a complete manure and match the nitrogen in the cyanamide against an equal amount of nitrogen in the sulphate of ammonia.

The manures were always applied separately and harrowed in a few days before sowing the seed. The quantities are all expressed per acre.

1. *Experiment with Barley*.—This was carried out in Little Hoos field, and followed swedes which were carted off. The land was in poor condition, and was unmanured for the previous crops. The plots also received 2 cwt. per acre of superphosphate (37 per cent.).

	Dressed Grain.		Weight per Straw.	
	Bushels.	Lb.	Bushel (lb).	Cwt.
200 lb. sulphate of ammonia ...	37·5	2,150	57·3	24
210 lb. cyanamide ...	34·3	1,970	57·5	19

The seed was Hallett's Chevalier, and was sown March 2nd, the crop being cut on August 22nd. This was a good even plant, standing up well.

From the first the appearance of the plant indicated that the sulphate of ammonia plot was a little the better and was providing more nitrogen for the crop.

2. *Experiment with Mangels*.—Also conducted in Little Hoos field. The land was in moderate condition, the previous crop having been potatoes, which had received farmyard manure.

* See Notes on Lime Nitrogen, *Journal*, May, 1905, (p. 101) and April, 1906, (p. 38).

Both plots received in addition to the nitrogenous manure 4 cwt. of superphosphate and 1 cwt. of sulphate of potash.

					Produce (tons).	
					Roots.	Leaves.
300 lb. sulphate of ammonia	...	...	...	...	23·5	4·9
315 lb. cyanamide	...	...	...	...	22·0	4·5

The seed was Yellow Globe, sown on May 12th. The plant was good and even, and the crop was lifted on October 21st. The superiority of the sulphate of ammonia is too small to be outside the limit of possible experimental error. It appeared, however, to be real and well marked in the early stages of growth.

3. *Experiment with Mangels.*—This experiment took place in Barn field. The land was in very poor condition, and had previously been cropped for many years with mangels with no manure. Superphosphate and sulphate of potash were applied to both plots as in 2.

					Produce (tons).	
					Roots.	Leaves.
300 lb. sulphate of ammonia	...	...	...	...	10·0	1·8
310 lb. cyanamide	...	...	...	...	11·1	2·0

The seed was Yellow Globe, and was sown on May 8th, the crop being lifted on October 26th. There was a very even plant, with few or no misses on both plots, but all the roots were small.

4. *Experiment with Mangels.*—In this case the land (Rickyard field) was in fair condition; the previous crop was wheat. Both plots received 36 lb. soluble phosphoric acid and 600 lb. sulphate of potash (the latter amount in error).

					Produce (tons).	
					Roots.	Leaves.
Sulphate of ammonia = 40 lb. nitrogen	...	...	...	...	27·9	4·5
Cyanamide = 40 lb. nitrogen	...	...	...	...	28·9	3·7

As in other cases, the seed was Yellow Globe, sowing taking place on May 10th. The seed grew well from the start, and there was an even plant with no misses. The crop was lifted on October 20th.

Results.—Taking the results together, and also considering those obtained in 1904, it is clear that the nitrogen in calcium cyanamide is practically of the same value as that in sulphate of ammonia. There is a slight balance of evidence in favour of the sulphate of ammonia, which is chiefly manifested in the early stages of the growth of the crop, probably because the cyanamide is a little slower in coming into action, but the

differences in the results are small and within the range of errors of experiment. Again, the Rothamsted soil is fairly well supplied with carbonate of lime, hence the sulphate of ammonia can exert its proper action, while no benefit is derived from the carbonate of lime which is produced in the soil from the cyanamide. Calcium cyanamide is decomposed within the soil into ammonia and calcium carbonate, 1 cwt. of cyanamide giving rise to at least 140 lb. of carbonate of lime. On many soils, particularly the clays and peaty soils, for which sulphate of ammonia is an unsuitable manure because it behaves like an acid, this carbonate of lime would be of value and should be counted to the credit of cyanamide as a manure.

The chief practical drawback to the use of cyanamide lies in the fact that it cannot be mixed with manures like superphosphate, but must be sown separately and scuffled into the soil some days before the seed is sown. The cost of production of cyanamide can only be settled when it has been put on the market on a commercial scale; it may, however, be taken as certain that if the manure can be sold on a parity with, or a little cheaper than, sulphate of ammonia, it may be employed by farmers on a large scale with every confidence of a good result.

A. D. HALL.

THE SECRETION OF MILK.

The structural facts relating to milk secretion have been investigated by various histologists, and the conclusions of Heidenhain, modified and extended by the work of Michaelis, have been recently corroborated by Brouha.

Brouha's researches were made on the mole, bat, and cat, and showed that the succession of events during one period of suckling in these animals was as follows:—

The acini and the ducts are gorged with milk just prior to suckling, and the epithelium of each acinus becomes almost pavement-like in flatness, approximating in appearance to that which clothes the ducts. This is due to the distension of the alveoli by the milk, and the pressure is sufficient to compress

the blood capillaries, so that in this state the secretory activity of the cells is suspended.

As soon as suckling commences the acinus is emptied, and the pressure upon the capillaries is released. The blood begins to flow freely around the acinus, the cells gradually regain the cylindrical shape which characterizes their active phase, and the elaboration of milk commences. The growth of the cells inwards is irregular. While remaining closely attached at their bases they become free internally, and project into the cavity of the acinus-like papillæ. At the same time fat globules appear in the cells in the form of minute drops, accumulating especially, however, in the projecting free inner parts of the cells. The nucleus may also be divided. The free portion of the cell with its contents is now detached, and the cytoplasm dissolves in the acinus, liberating the fatty contents, and a nucleus if such be present.

The secreting cells, after undergoing this change, continue to secrete fat globules of various sizes, which gradually approach the free surface, and are projected into the cavity of the acinus by cytoplasmic contraction. In this case, however, there is no sacrifice of the protoplasmic structure. The liquid portions of the milk are also added to the alveolar contents. This goes on until the ducts, and finally the acini, become once more gorged with milk, and the secretion in consequence gradually ceases with the increase of alveolar tension. The cells become stretched and flattened, the flow of blood is lessened, and the acinus ceases to function until it is emptied again.

In such a secretion period there is therefore (1) a short phase, when the cells are preparing for their function, which is consummated with a sacrifice of their free borders; and (2) a long phase, which lasts until the gland is filled with milk, and during which no further loss of protoplasm takes place. The activity of each cell during the period of secretion may be expressed by a curve of a wave-like shape, the anterior side of which, after gradually leaving the horizontal, rises rapidly to the crest, the posterior descending more leisurely to the base line.

If these may be taken to be the conditions which accompany the successive secretions in the cow, it may be said that a certain part at all events of the albumenoid constituents of milk

are contributed by the early breaking down of the cell. It may also be concluded that colostrum is due to an intensification of the first phase at the beginning of the milking period.

It is a well-known fact that in the cow and other animals the last-drawn milk, the "strippings," is richer in fat than that first removed. It has been usual to explain this as being due to a process of creaming in the udder. It has also been suggested that the more fluid portions would descend more readily than the fat. Such explanations, however, are not convincing, but with these morphological considerations before us it is possible to re-state the problem, and to indicate its solution.

An average cow yields, say, $1\frac{1}{4}$ gallons at each milking, or say, 1,400 c.c. from each quarter. It has, however, been computed that the total capacity of the udder is only 3,000 c.c., or 750 c.c. per quarter. This would mean that during the process of one milking as much again is added to the milk contained in the quarter at the commencement of milking. The process of milking one quarter, however, does not take longer than two and a-half to three minutes. It may, therefore, be concluded that the calculation of the distended capacity of the udder is erroneous. If it be the fact that milk secretion begins at this astounding rate so soon after milking has commenced, then it would be impossible to strip the udder of its contents, and milking might be presumed to go on continuously. It is, however, well known that the milk can be practically completely removed, and that no further milk can be withdrawn until some time has elapsed. Furthermore, it is manifestly impossible for the secretory cells to regain in the short time of milking a condition of activity which would account for an appreciable portion of the supply which is yielded. The capacity of the udder may therefore be said to be measured by the quantity of milk which may be removed at a single milking.

If this be the case, then, that the act of milking removes simply the milk which has accumulated since the previous milking, it is at once plain that the richness of the strippings is due to a re-absorption by the lymphatics of the liquid or watery constituents in the acini when the latter are in a state of distension.

It is more difficult to attempt an explanation of the reported diurnal variation in the quality and quantity of milk. The evening milk is usually richer than the morning, but experimental results are not in agreement with regard to the point. The investigations made by Ingle seemed to prove that when cows are milked at six-hour intervals the watery constituents are much increased between 11 p.m. and 5 a.m. An exactly opposite result was obtained at Offerton in the case of cows milked at twelve-hour intervals. The experiments, which were described by Bryner Jones, showed that a richer milk was obtained in the morning, and a greater quantity in the evening, even exceeding that got after a period of fourteen hours. Were the results of experiments more in agreement, it might be possible to suggest, for example, that the general effect which is believed to be true from the experience of dairy farmers, is due to nervous change during the hours of darkness. But further experiments are evidently necessary before the problem can even be stated.

A. MEEK.

The potash deposits of Germany were first discovered in 1839 at Magdeburg, where in boring for rock salt a layer of potash and magnesium salts was met with covering the

**The Potash
Deposits
of Germany.**

rock salt. Their value for agricultural and other purposes was not at first recognised, but in 1861 the first chemical factory was erected at Stassfurt for the production from these salts of chloride of potash, &c., and thus was laid the foundation of the chemical industry which has since reached such large dimensions. About this time the attention of agriculturists was directed to these salts by two prominent agriculturists, Rimpau and Schultz-Lupitz, who had proved their great value in improving the peaty and sandy soils of the Province of Saxony.

The deposits are now found in Magdeburg, Anhalt, Hanover, Brunswick, Thüringen, and elsewhere in neighbouring parts of Germany, and they derive very great importance from the fact that no large potash deposits are known to exist in any other part of the world, though smaller deposits have been discovered in Galicia, in Persia, and in the Punjab.

The natural salts consist of kainit, hartsalz, sylvinite, carnallite, and kieserite. Of these kainit is the most important for agricultural purposes.

According to a handbook ("Die Kalisalze") recently issued by the German Agricultural Society, the average composition of each of these salts is as follows :—

—	Kainit.	Hartsalz.	Sylvinit.	Carnallit.	Berg-kieserit.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Potassium Sulphate (K_2SO_4)	21·3	—	1·5	—	—
Potassium Chloride (KCl) ...	2·0	21·73	26·3	15·5	11·8
Magnesium Sulphate ($MgSO_4$)	14·5	26·95	2·4	12·1	21·5
Magnesium Chloride ($MgCl_2$)	12·4	1·71	2·6	21·5	17·2
Sodium Chloride ($NaCl$) ...	34·6	38·52	56·7	22·4	26·7
Calcium Sulphate ($CaSO_4$)...	1·7	—	2·8	1·9	·8
Matter insoluble in water ...	·8	5·67	3·2	·5	1·3
Water	12·7	4·97	4·5	26·1	20·7

Kainit.—In a pure state, kainit is composed of sulphate of potash, sulphate of magnesia, chloride of magnesia, and water, but in its natural condition, as obtained from the mine, it always contains in addition a quantity of common salt (sodium chloride). Kainit is sometimes spoken of as a sulphate of potash and magnesia, but this is not quite correct, as it contains in addition chloride of magnesia, a small quantity of chloride of potash, as well as 35 per cent. of chloride of sodium, so that the chlorides amount altogether to 49 per cent. This is less than that in carnallite, but it is sufficient to suggest caution in applying it in those cases where chlorides are likely to be injurious. Kainit hardens into lumps when stored, particularly in damp places, so that it cannot easily be distributed, and in order to prevent this mixing with $2\frac{1}{2}$ per cent. of dry earth or peat is recommended where it is not intended for immediate use. Kainit is usually guaranteed to contain 12·4 per cent. of pure potash.

Among the other natural potash salts are :—

Hartsalz.—This salt is rich in chlorides, of which it contains 62 per cent. Its potash content is not less than 12·4 per cent., so that as a manure it is similar to kainit.

Sylvinit.—This potash salt contains 85·6 per cent. of chlorides, and has on the average 17·4 per cent. of potash, though only guaranteed to contain 12·4 per cent.

Carnallit.—This is principally employed for trade purposes

and for the production of chloride of potash, but it is also used as a fertilizer. It contains 9·8 per cent. of potash and 60 per cent. of chlorides.

Bergkieserit.—This contains 7·5 per cent. of potash.

There are also several purified or manufactured salts obtained from the above products. The double sulphate of potash and magnesia is very rich in potash and almost free from chlorides, containing 27·2 per cent. of pure potash, but it is very much dearer per unit than the natural salts. This is also the case with sulphate of potash, which is prepared in two grades, viz., 96 per cent. sulphate (51·8 per cent. potash) and 90 per cent. sulphate (48·6 per cent. potash). Chloride of potash is sold in several grades guaranteed to contain 56·8, 50·5, and 44·5 per cent. of pure potash. Another prepared potash fertilizer containing chloride of potash is sold in Germany under the name of 40, 30, or 20 per cent. "kalidüngesalz"; the amount of chloride of potash in each grade is respectively 62·5, 47·6, and 31·6 per cent.

The production of potash salts has now reached very large dimensions, and a number of the mines and factories are combined for the purposes of sale in the Potash Syndicate, which represents the interests of twenty-eight works. The formation of this Syndicate dates from 1876, and it has a somewhat special character, owing to the fact that it includes the mines belonging to the Prussian Crown and to the Duchy of Anhalt. The Prussian Government, it is stated,* took part in this Syndicate not only in the interests of its own mines but also in the agricultural interest, for the purpose of reserving to itself a certain right in the fixing of the price at which the products should be sold to agriculturists. Its influence has made itself felt by securing the sale of potash on special terms to German farmers through the German Agricultural Society and other Agricultural Associations.

The extent to which the consumption of natural potash salts has grown in Germany may be gathered from a return made by the German Agricultural Society. In 1885 the amount used was 1,375,000 cwt., in 1895 it was 9,593,000 cwt., and in 1903 20,836,000 cwt. Of this amount about 20 per cent. is at the present time supplied through the Society, apart from the quantities purchased from other Agricultural Associations. It

* *Jahrbuch der Deut. Land. Gesell.*, 1901, p. 173.

is calculated that the average amount of pure potash applied to agricultural land in Germany has grown since 1890 from 69 lb. to 392 lb. per 100 acres.

The production of kainit and other salts in the German Empire in 1904 and 1903, according to the official returns, was :—

	1904.		1903.	
	Quantity.	Value.	Quantity.	Value.
	Cwt.	£	Cwt.	£
Kainit	37,507,974	1,328,000	30,646,542	1,094,000
Other Potash Salts ...	42,891,989	1,115,000	40,810,810	1,049,000

The exports of potash salts in 1904 amounted to 12,433,000 cwt., compared with 9,867,000 cwt. in 1903 and 9,215,000 cwt. in 1900. The United States is the largest customer, taking in 1904 6,784,000 cwt., Sweden and Holland come next, while 892,000 cwt. are returned as exported to Great Britain.

In this connection it is of interest to note that a proposal has recently been made for restricting the export in order to maintain the supply available for home consumption. At a meeting of the German *Landwirtschaftsrat* (February, 1906) it was pointed out that potash is one of the most important plant foods, and is indispensable to the agricultural industry of Germany, whilst at the same time it forms an important raw product for numerous home industries. Both farmers and traders have a very decided interest in seeing that potash is always available for home consumption at moderate prices. For this reason it was urged that precautions should be taken to preserve the potash contained in German soil in the first place for the use of Germany. This, it was suggested, could be most easily done by the State acquiring the whole of the potash mines, but as this was an end which could not be reached at once, the German *Landwirtschaftsrat* proposed as a first step that the State should so far extend its direct share in the supply of potash as to be able at all times to exercise a preponderating influence in fixing its price, while to avoid its shipment to foreign countries the introduction of an export duty was recommended.

The attention of the Board has been directed to several cases in which serious accidents have occurred owing to the insufficient fencing of farm machinery. In

**Precautions
against Accidents
caused by
Farm Machinery.** ordinary cases farm machinery is used solely for estate purposes and not in the manufacture or adaptation of any article

for sale, and the provisions of the Factory Acts dealing with the fencing of machinery therefore do not apply. In the case of threshing machines and chaff-cutting machines worked by any motive power other than manual labour the Acts referred to later in this article require the machines to be so constructed as to secure the safety of the person feeding the machine, and farmers should be careful to see that these requirements are effectively complied with.

Apart from the necessity of securing the safety of men working the machines, the importance of safeguarding other persons against the risk of having some part of their clothing accidentally caught or entangled in machinery is one that ought not to be overlooked, and the Board would urge all farmers to take special precautions in this direction. All shafting, whether vertical, horizontal, or oblique, which is not more than seven feet from the ground or floor, should be fenced by metal or wooden coverings. This should also be done with belting.

Gearing and cog-wheels should also be covered with a wire cage or some similar protection, while fly-wheels, water-wheels, and other parts of the machinery should be securely fenced.

Boilers used for generating steam should be thoroughly examined by an insurance company's engineer or other competent person at least once in every fourteen months.

The main provisions of the Threshing Machines Act, 1878, and the Chaff-Cutting Machines (Accidents) Acts, 1897, are given below.

Threshing Machines Act, 1878.—This Act, which does not apply to Scotland or Ireland, provides that the drum and feeding mouth of every threshing machine, worked by steam or by any motive power other than manual labour, shall at all times when working be kept sufficiently and securely fenced, so far as is reasonably practicable and consistent with the due and efficient working of the machine.

Chaff-Cutting Machines (Accidents) Act, 1897.—This Act requires that so far as is reasonably practicable and consistent with the due and efficient working of the machine, the feeding mouth or box of every chaff-cutting machine worked by motive power other than manual labour shall be so constructed or fitted with such apparatus or contrivance as to prevent the hand or arm of the person feeding the machine from being drawn between the rollers to the knives, and that the fly-wheel and knives shall be kept sufficiently and securely fenced at all times during working.

A penalty of £5 may be imposed for non-compliance with these Acts, and provision is made for enabling constables to enter premises for the purpose of seeing whether the Acts are complied with.

In response to the recent circular letter* which was addressed by the Board to the principal Fruit and Horticultural Associations

**Telephones in
Rural Districts.**

and Societies as to the provision of telephonic communication in rural districts, a number of replies and applications have been received which have been submitted for the consideration of the Postmaster-General. Enquiry is being made in connection with each application, and in a few of the cases the applicants' wishes can probably be met without difficulty by the Post Office or by the National Telephone Company. As communication with large centres of population throughout the country is required, arrangements for communication with the nearest market towns only will not, as a rule, meet the purpose, and, unfortunately, in a large number of cases the cost of providing circuits between the villages and the nearest Trunk Exchanges may prove to be prohibitive.

The Board desire, however, to draw the special attention of Horticultural Societies and fruit growers generally to the fact that owing to the facilities introduced in the Budget, on the suggestion of the Postmaster-General, guarantors of telephone extensions will, in future, only be called upon to bear one-third of any deficiency that may arise under the guarantee, instead of bearing the whole deficiency as was formerly the case,

* See *Journal*, February, 1906, p. 693.

and this may help growers in some cases to obtain what they require. The basis of this guarantee is explained in the following general statement which has been furnished to Lord Carrington by the Postmaster-General :—

In cases where the Postmaster-General is satisfied that the establishment of a call office is desirable on general considerations, although there may not be an immediate prospect of remunerative business, he is prepared to consider applications for call office facilities favourably, provided a guarantee is given to the extent of one-third of the balance of the expenses over the revenue.

The expenses will include the cost of maintaining the wires, apparatus, and silence cabinet, also the cost of attendance, account keeping, and accommodation, together with the interest on the capital outlay. The revenue will be arrived at by taking the call office receipts, including the charge for the use of the local line provided under guarantee, but excluding charges for the use of the trunk wires. Thus, assuming that the annual expenses in connection with a call office amounted to £20, and the receipts amounted to £11 in the year, at the end of the year the guarantors would be called upon to pay £3, that is, one-third of the deficit, and the State would bear the remaining two-thirds of the loss.

With regard to a suggestion that public telephone call offices should be opened at villages where the telegrams are at present forwarded and received by telephone, the Postmaster-General states that he would be very glad if it were possible to do this, but, unfortunately, the circuit is, as a rule, unsuitable in construction for use in conjunction with the trunk wire system, and moreover very often is not led into a post office where the trunk wires are available. In such cases call offices in connection with the trunk system cannot be provided without considerable expense. The Postmaster-General will, however, be glad to enquire into any such case that may be brought to his notice.

The Board have received a considerable number of replies to their recent circular letter addressed to Agricultural Societies and Farmers' Clubs, in which it was suggested that in view of the marked increase in the number of rooks during recent years, Societies might

approach owners of rookeries in their district, asking that at the proper season energetic action might be taken to keep the birds within reasonable limits. The replies which have been received provide ample evidence of the injury caused by rooks in arable districts, and of the difficulty which is experienced in keeping the numbers of these birds down. Several Societies have in previous years taken the step recommended by the Board, and in certain instances attempts are annually made to reduce the rookeries in the neighbourhood by an organized shoot, with apparently good results. Subscriptions are sometimes invited to enable this to be done. The suggestion of the Board seems to have been generally welcomed as a practical one, and communications have been addressed to owners of rookeries accordingly. In a few instances notices were inserted in the public Press calling attention to the matter, and it is hoped that the effort now made will have satisfactory results.

One method which appears to have been adopted with success in Scotland seems worthy of mention. The plan in this case was to select a frosty night, just after the rooks had laid their eggs, but before they were sitting closely, and to place a man with a gun in every clump of trees where the rooks were for an area extending over two or three miles of country. At a fixed time shooting was begun, not so much with the idea of killing the birds, but more particularly for the purpose of keeping them off the nests. Firing was kept up for about three hours from just before dusk, with the result that the eggs were frosted and became infertile. This has now been done regularly for four years, with the result that the rooks are considered to have decreased by 80 per cent., and their numbers are now quite within limits.

Another correspondent mentions that cutting up a dead rook and putting the pieces about the field deters the birds from pitching on it, much more than putting whole birds on the ground.

Treating seed wheat and barley with coal tar at the rate of 1 quart of tar to 1 quarter of wheat is also mentioned as a successful means of protecting grain against rooks. A little lime should be added to the seed the morning after treatment as a drier before drilling. A note on this subject appeared in this

Journal (December, 1904, p. 544), in which two solutions are mentioned, viz., $2\frac{1}{2}$ oz. of coal tar, $2\frac{1}{2}$ oz. petroleum mixed with one quart of water per bushel of seed; and $11\frac{1}{2}$ pints of coal tar, $5\frac{3}{4}$ pints of petroleum, $11\frac{1}{2}$ pints of carbolic acid to 5 quarters of seed. In making the latter mixture the coal tar should be made quite hot, the petroleum added and then the carbolic acid, the whole being well stirred; this should be poured on the grain at the rate of about 2 pints to 4 bushels. This must be stirred up quickly till each grain is blackened. In order to dry the seed about 2 pints of phosphate of lime must be mixed in afterwards.

Maize is a crop which can be successfully grown in the southern and south-eastern counties of England, and it provides a large bulk of succulent material for fodder.

**Utilization of
Green Maize for
Fodder.***

The crop may be utilized in several ways. It is found to be very useful for scattering on bare pastures in August and September, where it is readily eaten by all kinds of stock, not excluding pigs. In America, and to some extent in this country, the main value of the crop is due to the opportunity it provides, through the agency of ensilage, of securing a supply of nutritious succulent material for use in the winter and spring months.

The quality of the silage that maize produces is excelled by that of no other crop. If maize be utilized in this way, it should stand till it is as mature as it is likely to become in this country, though it must be got off the fields before the occurrence of autumn frosts. Generally speaking, the latter half of September is the best time to make maize silage, which may be produced in stacks, draw-heaps, silos, pits, &c. (For general information in regard to ensilage, see Leaflet No. 9.) The practice of several farmers is to utilize as much of the crop as possible in a green condition, and, about the middle of September, to make what remains into silage. In order to admit of the completion of the fermentative changes, it is desirable not to feed maize silage to stock till well into spring. At that time a good sample is of a greenish brown colour, and emits an aroma almost indis-

* See Leaflet No. 73.

tinguishable from that of strong tobacco. It is much relished by stock, and seems to have a feeding value equal, if not superior, to that of mangolds.

Another way of utilizing the crop has recently been brought to the notice of the Board by Mr. George Allen, who says that on his farm at Hook Norton the maize is planted in somewhat wider rows than usual and sheep folded on it. The sheep are turned into a portion at the end of August. They begin to eat from the top and work downwards, cleaning it all up, and are then moved on.

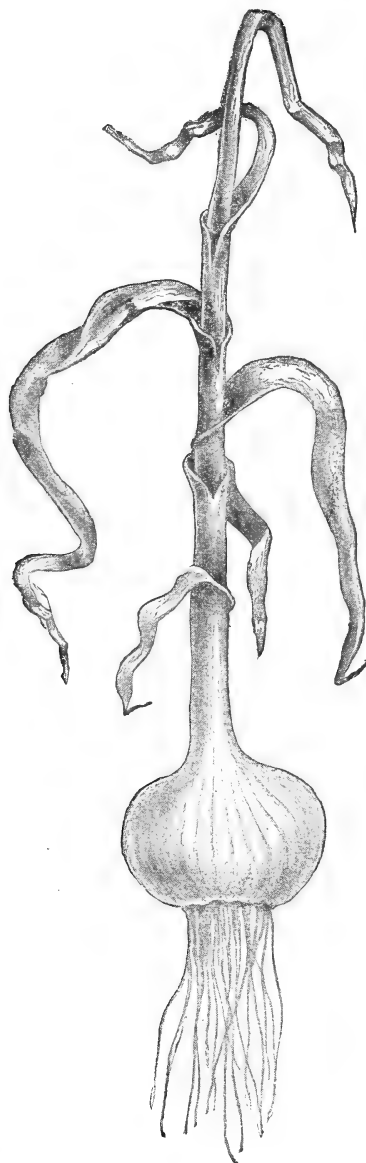
This well-known disease occurs wherever the onion is cultivated. The first sign of the disease is the appearance of small, scattered yellowish patches on the leaves. These patches gradually increase in size and blend with each other, until finally the entire leaf presents a sickly yellow appearance, and becomes thickly covered with a white powder. This has the appearance of hoar-frost, but soon changes to a dingy lilac colour. The powder consists of the spores of the fungus, the spores being produced in immense numbers, and soon infesting neighbouring plants. If a diseased leaf is examined with a good pocket-lens, the spores will be seen to be produced on branched threads which emerge through the stomata of the leaf, and form a miniature forest on its surface.

Onion Mildew
(*Percnospora*
schleideni).

During the early stage of the disease the fungus exercises a very marked stimulating effect on the growth of the onion. This is shown by the rapid increase in length of that portion situated between the top of the bulb and the base of the leaves. This abnormally elongated portion is spoken of as the "neck," as shown in the accompanying figure. The presence of this "neck" is a certain sign of the existence of the disease. As the disease progresses all growth of the bulb is arrested, but the bulb itself is not attacked; hence, if the fungus appears when the onions are fully grown, or nearly so, the crop is not destroyed. On the other hand, when attacked during the early stage of

growth, as is usually the case, the crop is completely destroyed, unless preventive measures are applied.

Preventive Measures.—The disease in its epidemic form is



ONION ATTACKED BY MILDEW.

entirely due to the particular kind of fruit described above which appears under the form of very fine powder on the leaves. This is quickly dispersed broadcast by wind or insects. As a

rule, the disease spreads in the first instance from one or more centres, which are indicated by the yellowing of the leaves. If prompt measures are resorted to the disease can be held in check. All plants showing a trace of disease should be removed and burned, and the healthy surrounding plants, or preferably the entire crop, should be dredged with a mixture of powdered quicklime and sulphur, in the proportion of one of lime to two of sulphur. The dredging may be done by placing the mixture in a muslin bag and shaking it over the plants, or by specially made bellows or other contrivances now on the market. The work should be done when the plants are covered with dew.

It is very important that as far as practicable every trace of diseased onions should be collected and burned, and not thrown on to the manure heap or into the piggery. If such are allowed to decay on the land, a recurrence of the disease is almost certain, as a second form of fungus-fruit is produced in the decaying tissues of the leaves. This fruit remains unchanged until the following season, or, if deeply buried, may remain so for several years, and when again brought to the surface in the ordinary routine of cultivation germination takes place, and if onions happen to form the crop, infection follows.

The following article by Mr. George Massee on the perpetuation of Potato Disease and Potato Leaf Curl by means of hybernating mycelium appears in the Kew Bulletin (No. 4, 1906) :—

**Perpetuation of
Potato Disease
and Potato
Leaf Curl.**

The sudden and simultaneous appearance of "Potato-disease," caused by *Phytophthora infestans*, De Bary, over widely extended areas in Britain and other countries has hitherto been attributed to the rapid production and diffusion of spores during a period when special meteorological conditions favoured the rapid development of the fungus.

This explanation, however, when carefully considered, proves to be altogether inadequate. When a potato plant infected with the spores of *Phytophthora* is placed under a bell-jar in a very damp atmosphere, subdued light, and high temperature—

conditions most favourable to the development of the parasite—it is only after a period of four or five days that the fungus produces fruit on the leaves, and then only at the point of infection. On the other hand, the fact is too well known that a field of potatoes or all the potato fields in a certain district which at a given moment appeared perfectly healthy and vigorous, have, under certain climatic conditions, been reduced to a blackened, decaying, foetid condition within twenty-four hours. Again, in the case of every fungus epidemic proved to be due to the diffusion of spores, the disease always originates from one or more primary centres of infection, and gradually extends, whereas in the case of potato disease the appearance of the epidemic is often simultaneous over a considerable area.

These considerations suggested the existence of some method other than dissemination by means of spores as the cause of such sudden outbreaks of disease. The presence of mycelium can readily be demonstrated in the tissues of diseased potato tubers, and a series of experiments conducted at Kew have conclusively proved that such hybernating mycelium in a tuber is capable, under favourable conditions, of perpetuating the disease.

Three diseased potato tubers showing rusty stains characteristic of the presence of *Phytophthora* mycelium in the flesh were each cut into two equal parts. Each half tuber was planted separately in a plant pot; the same kind of soil and manure, sterilized by steam, was used in all the experiments. Three of the pots were placed in a house having a temperature ranging between 70 deg. and 80 deg. F., in dull light, and with the moisture often at saturation point. Each pot was placed under a bell-jar. The three remaining pots were placed in a well-lighted house, without any artificial heat, and with an exceptionally dry atmosphere. These pots were not placed under bell-jars. An equal amount of water was supplied to each of the six pots. The three plants grown under conditions of high temperature, dull light, and much moisture in the air, showed the first indication of *Phytophthora* when the shoots were six weeks old, and a fortnight later the three plants were blackened and destroyed by the fungus.

The three plants grown in the cool, well-lighted, dry house

showed no trace of disease at the end of two months, when one of the plants was removed to the warm house and placed under a bell-jar. Within nine days this plant was blackened and killed by the fungus. A fortnight later a second plant was removed from the cool to the warm house and placed under a bell-jar. Within a week of the removal of this plant it was also covered with *Phytophthora*. The third plant continued growing in the cool house for thirteen weeks, and remained perfectly free from *obvious* disease.

Similarly marked results were obtained by using potato tubers produced by a plant that was badly infested with potato "leaf-curl" (*Macrosporium solani*, Cooke), proving that this disease can also be perpetuated by hybernating mycelium present in the tubers.

The above experiments, in addition to proving that the diseases indicated can be transmitted from one generation to another by means of mycelium present in the tubers, also demonstrate another point of much practical importance, namely, that the absence of *obvious* disease in the crop does not necessarily prove the absence of such disease in a *latent* form.

In the experiments described above, it was known at the commencement that the six half-tubers were all diseased. The three plants grown in the hot, damp, badly-lighted house were promptly destroyed, simply because the conditions indicated were detrimental to the growth of the potato but highly favourable to the rapid development of the fungus, which soon became dominant and destroyed its host-plant. On the other hand, the three potato plants in the cool house grew normally under the lower temperature, less atmospheric moisture, and better light, a set of conditions very detrimental to fungus growth; hence, although the parasite was present, it remained entirely in abeyance, and the practical man would, without hesitation, have pronounced the plants free from disease.

Every potato grower of experience can predict almost with certainty the moment when potato disease will appear; the necessary conditions are warm, damp, dull weather, but instead of the sudden outbreak being due to the rapid diffusion of spores, as has hitherto been believed, it is far more probable

that in the majority of instances it is due to the existence of mycelium, already present in the tissues, which has hitherto been prevented from manifesting itself in an aggressive form owing to the absence of favourable climatic conditions.

The Board of Agriculture and Fisheries have received information that the Diamond-back moth (*Plutella maculipennis*)

Diamond-Back Moth in Norfolk. has again made its appearance in Norfolk, and that considerable damage has already been done. Copies of a leaflet giving a description of this insect, and suggesting remedies and methods of prevention, can be obtained free of charge and post free, on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. Letters should be marked "Intelligence Branch," and need not be stamped. The Board desire to impress on all farmers the importance of examining their turnip fields at once, and of taking steps to protect their crops.

Russia.—According to the reports which have appeared in the *Commercial and Industrial Gazette* up to 17th June, it

Notes on Foreign Crops. appears that owing to unfavourable weather in May the condition of the crops in Central Russia has deteriorated and is now only approaching medium. Winter wheat promises a crop above the average, rye and summer wheat below the average. On the whole the total crop in European Russia will probably be a medium one for the winter grains and below the average for the spring crops.

Germany.—According to the official report on the condition of crops in the middle of June, the average condition of winter wheat was 2·2, of spring wheat 2·4, of winter rye 2·5, of spring rye 2·3, of barley 2·3, of oats 2·2 and of potatoes 2·6 (very good = 1, good = 2, medium or average = 3). The prospects for winter grain are generally regarded as favourable, and the wet weather during the period covered by the report has had

a good effect on the spring corn. Potatoes in many instances have come up irregularly, and their growth has been somewhat retarded by cold wet weather; on heavy land it has not been possible to do the necessary weeding, but as warm dry weather occurred shortly before the issue of the report this work is expected to be got on with and the growth of the crop much encouraged.

Hungary.—The official report of the Minister of Agriculture up to the 15th June gives the following preliminary estimate of the probable yield of crops in Hungary :—

	In tons (of 2,204 lb.).	
	1906.	1905.
Wheat	46,098,700	42,867,832
Rye	12,883,900	13,739,126
Barley	12,789,500	13,597,440
Oats	11,266,000	11,322,978

The cold wet weather which was experienced in the first half of June made the prospects for the wheat harvest somewhat less favourable than they were.

France.—The official report of the Ministry of Agriculture estimates the area under the crops on the 15th May, 1906, as follows. The figures for the same date in 1905 are given for comparison :—

	1906.	1905.
	Acres.	Acres.
Winter wheat	15,539,155	15,678,252
Spring wheat	495,434	370,546
Mixed corn	372,236	373,101
Rye	3,079,820	3,136,457
Barley	1,762,367	1,784,263
Oats	9,493,778	9,415,205

The condition of the crops is stated to be good in the case of winter wheat on an area of 4,490,800 acres, fairly good on 10,400,800 acres, and passable on 647,500 acres. In the case of spring wheat the condition on 1,235 acres was declared to be very good, good on 259,300 acres, fairly good on 203,100 acres,

and passable on 31,700 acres. In the case of rye about one-third of the total area was returned as good and rather less than one-half as fairly good.

The spring barley and oats were not through the ground in all the Departments, but approximately nearly one-half of the barley promised to be good, while in the case of oats 38 per cent. was classed as good (or very good) and 57 per cent. as fairly good.

United States.—According to the returns received by the Department of Agriculture the area sown with spring wheat on 1st June amounted to about 17,989,000 acres, an increase over the area returned in the previous year of 38,000 acres. The average condition of the crop was 93 compared with a ten-year average of 94.

The average condition of winter wheat declined from 91 on 1st May to 83 on 1st June, but this figure is still above the decennial average of 80·7.

The total reported area under oats is about 27,678,000 acres compared with 27,688,000 returned as sown on 1st June last year. The average condition of the crop was 86 compared with 92·9 at the same date last year.

The acreage under barley is estimated to be about 133,000 acres more than in 1905. The average condition is 93·5 against the ten-year average of 90·2.

India.—The final general memorandum on the Indian wheat crop states that the crop as a whole was a good one, for while the total area falls short of that of 1904-5 by 2,244,000 acres, or nearly 8 per cent., the outturn is believed to exceed that of the said year by 978,000 tons, or 13 per cent. The crop is estimated at 8,560,340 tons from 26,226,200 acres.

Argentina.—According to the River Plate Review (11th May) the Department of Agriculture estimates the probable yield of maize at 4,951,000 tons (of 2,204 lb.) from an area of 6,712,000 acres. The largest previous harvest was in 1904, when 4,450,000 tons were gathered. In 1905 the yield was estimated at 3,574,000 tons, of which quantity 2,278,000 tons were exported.

In the Board's *Journal* for March, 1905, an article on calf rearing dealt with the methods practised on a North-country farm, while other notes on the subject have

**Fattening Calves
in Belgium.**

appeared from time to time.* Various methods prevail in different parts of the country, but it has long been recognised that for general purposes new milk continued for long is too expensive as a calf food. In a paper read before the International Congress on L'Alimentation Rationnelle du Bétail at Liège in 1905, M. Fr. Smeyers gave an account of the system adopted in certain districts of Belgium where the fattening of calves is conducted on a large scale. In the neighbourhood of Louvain calves are fattened with partially skimmed milk which has been set for six or eight hours. Such skim milk contains a large proportion of fat, and has therefore been found very suitable for the purpose. As a general rule the calves are fed exclusively on such milk. Feeding with whole milk as formerly practised is tending to disappear, as it is found not to pay. This was shown by an experiment carried out in 1891, on a farm at Diest, in which twenty-two calves were fed on whole milk. The average daily gain in live weight varied from 1·8 lb. to 3·2 lb., and the return obtained for the milk utilized in this way amounted to an average of 4·45d. per gallon only. On another farm five calves consumed 931 gallons of milk containing an average of 3·3 per cent. of fat, producing 998·6 lb. of live weight, giving a return for the milk of nearly 5d. per gallon, and it is observed that at such figures farmers are well advised not to feed whole milk to calves.

In skimming by the process usually practised on Belgian farms, milk of a fat content of 3·2 per cent. retains about 1·36 per cent. of its fat (a mean of fifty analyses). It is such partially skimmed milk which the farmers of the Hageland employ for fattening purposes, and from numerous personal experiments M. Smeyers states that calves fed exclusively on this milk consume on the average $1\frac{1}{2}$ gallons to produce 1 lb. live weight. Sixteen calves so fattened consumed an average of almost exactly that figure, their sale price being about 5d. per lb. live weight, or, calculated in terms of milk, about 2·97d. per gallon. On adding the value of the butter produced from the cream

* *Journal*, April, 1904, p. 39; March, 1904, p. 526; September, 1903, p. 210.

removed, and which amounted to 2·65d. per gallon, the total return for the milk is 5·62d. per gallon.

Since the introduction of the cream separator many farmers have substituted separated milk for partially skimmed milk, adding fatty or farinaceous materials in place of the removed fat of the milk. As an adjunct to the milk, potato starch is much recommended. Some farmers add wheat bread, which is excellent; others give mixed meals, decoctions of linseed meal, &c. Personally, M. Smeyers has obtained the best results by using potato starch, with the addition of one-third of malt flour. The following table gives the results of three experiments made at the dairy school at Betecom. Three calves were fed exclusively with separated milk (from a co-operative dairy) and potato starch:—

—	I.	II.	III.	Total.
Duration of test (days)...	101	111	88	—
Initial weight of calves (lb.) ...	70·4	79·2	103·4	253
Weight when killed (lb.) ...	242	294·8	288·2	825
Increase in weight (lb.) ...	171·6	215·6	184·8	572
Average daily gain (lb.) ...	1·7	1·94	2·1	—
Purchase price ...	20/-	22/-	32/-	74/-
Sale price ...	88/-	128·6	117/4	333/10
Increase of sale over purchase price ...	68/-	106/6	85/4	259/10
Milk consumed (gals.)...	295·6	440·8	320·3	1056·7
Potato starch consumed (lb.) ...	24·2	35·2	9·9	69·3

From the increase of the sale price over the purchase price the cost of the potato starch (9s. 1d.) must be deducted, as also the cost of sale and delivery of the calves (8s. 5d.). This leaves £12 2s. 4d. The separated milk therefore (1,056·7 gallons) gave a return of slightly over 2¾d. per gallon.

Analogous results have been obtained in numerous practical trials carried out in Belgium and elsewhere, the return per gallon of separated milk frequently being over 2½d. and occasionally over 3d.

A point to which M. Smeyers draws attention is that the milk should be quite fresh. In standing overnight, especially in hot weather, or when it has to be fetched from a creamery, changes are likely to take place; the milk may become acid in character, to a greater or less extent according to the care exercised.

In fact, between the time it comes from the creamery until it is all used for feeding purposes, the acidity may be doubled. The accidents which occur with calves fattened on skimmed or separated milk are generally attributed to lactic acid, but it is probable that most calves would suffer no inconvenience from a pronounced acidity, provided it did not vary in intensity from one feed to the next, and if the calves were gradually accustomed to it. In Brabant, Flanders, and some other districts the method of butter-making is to churn whole milk, and the whey, although highly acid in character, is taken by the calves without any inconvenience whatever. Indeed, in an experiment undertaken at the school of Oplinter from March 17th to May 11th, 1905, two calves were fed with milk gradually increasing in acidity, and they gained steadily in weight, developed normally, and showed no bad symptoms for about six weeks, when a very high degree of acidity was reached and they became seriously ill, being constantly "blown" and rapidly losing flesh. M. Smeyers is of opinion that in fattening calves with skim milk from creameries many accidents could be avoided by regulating the acidity so that it varied as slightly as possible from meal to meal.

According to Order No. 73 of the Department of Agriculture and Technical Instruction for Ireland,* horses, asses, or mules brought to Ireland from Great Britain, the

**Importation of
Horses into
Ireland.**

Isle of Man, or the Channel Islands, must comply with the following regulations.

There must previously be produced and delivered up to an authorized Inspector of the Department at the port of landing :—(1) A declaration made and subscribed before a magistrate by the owner or his authorized agent within three days prior to the date of shipment indicating that the horse, ass, or mule had not within two months immediately preceding the date of such declaration been affected with disease (*i.e.* glanders, including farcy and parasitic mange),

* Importation of Horses, Asses, and Mules (Ireland) Order of 1906. (Dated 29th May, 1906.)

and had not during such period been in any premises or on any vessel in or on which disease existed, and had not been exposed to infection either by contact with a diseased animal or through the medium of clothing or harness ; (2) a certificate of a duly qualified veterinary surgeon, granted within two days prior to the date of shipment, and containing a full description of the animal for the purposes of identification, to the effect that such animal is free from glanders (including farcy) and parasitic mange. The landing of the animals shall also be subject to such veterinary examination on behalf of the Department as they may prescribe. Notice of the importation must also be given on the arrival of the animal at its destination to the local authority of the district.

Horses, asses, and mules under the care and supervision of the Army Veterinary Department are exempt from the regulations laid down by this Order.

The quality of a cider depends mainly on two factors, viz., the quality of the original apple juice and the nature of the changes which the juice undergoes during the course of its conversion into mature cider. These changes are commonly spoken of as the fermentation of the juice.

**Alcoholic
Fermentation in
Cider.***

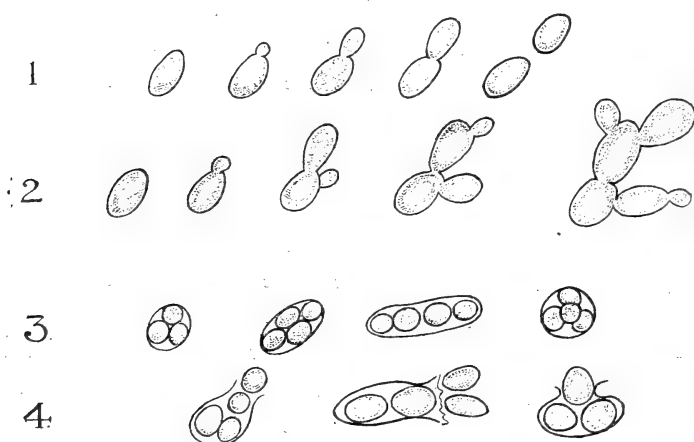
This term, however, does not refer merely to one particular kind of change, or to a single process, but includes a number of perfectly distinct processes, such as :—(a) the change of sugar into alcohol ; (b) the diminution of acidity ; and (c) the changes of the mucilaginous and starchy materials contained in the juice. The most important of these changes probably is the first mentioned (a), which is termed alcoholic fermentation, and the following account deals solely with it, the means by which it is brought about, and certain points connected with it which are of importance practically.

Alcoholic fermentation is the result of the action of certain living organisms or germs, called yeasts, on the sugar contained in the apple juice. Yeasts find their way into the juice from

* A leaflet published by the National Fruit and Cider Institute.

various sources, many for example being found attached to the skins of apples and being washed off into the juice at the time of grinding and pressing the fruit, while some are always present in the atmosphere of cider-making premises and attached to the appliances used for cider-making.

Yeast, though called a germ, is an exceedingly minute plant. In structure it is one of the simplest members of the plant kingdom, each individual consisting only of a small globular mass of living matter, surrounded by a protective covering or wall, such a structure being termed a cell. Higher forms of plant life, *e.g.*, apples, consist of a very large number of cells grouped together to form the tissues or the body, but the yeast



FIGURES SHOWING MULTIPLICATION OF YEAST PLANTS—
BY BUDDING, 1, 2; AND SPORE FORMATION, 3, 4.

plant consists of a single cell only. Its size is so small, that thousands can be contained in a small drop of water. Its method of growth or multiplication is also simple. At some point of the cell a small protuberance begins to develop, which gradually increases in size and assumes a roundish shape, until it at length is almost as large as the parent cell, which it entirely resembles. During this period the parent and daughter cell have remained attached to and in communication with one another at the point where the latter first appeared, but later they separate from one another, two adult plants exactly the same in character as the original one thus being produced. This process is known as "budding," and may be compared to the

method by which a series of soap bubbles can be produced and blown from a single bubble, each one separating itself off when it reaches a certain size. It occurs when the conditions are favourable for growth. Its rapidity is remarkable; under favourable circumstances several thousand new plants can be formed in twenty-four hours, starting originally with a single cell only. When conditions are unfavourable for growth, a different method of reproduction is frequently made use of. This consists in the living matter or "protoplasm" of the cell dividing up into a few small rounded masses inside the wall of the original cell, while around each of these bodies or spores a new wall is formed. When favourable conditions for growth occur again, the old wall splits open and sets free the spores, which swell up and begin to grow, producing new plants by budding. The spores may be compared to the seeds of ordinary plants, while the budding may be compared to the way in which plants are propagated by buds, grafts or cuttings. These spores possess considerable powers of withstanding heat and cold, which the ordinary type of cell does not possess to anything like the same extent. The accompanying figures show the methods of multiplication of the yeast plant by budding and by spore formation.

The rapidity of multiplication depends on the extent to which the conditions of growth are favourable. The most important conditions, as with ordinary plants, are the nature and amount of the food supply and the temperature.

Assuming for the present purposes that apple juice possesses the necessary qualities for the multiplication of the yeast plants, the consideration of the action of these on the juice can be proceeded with.

When yeast plants grow in a liquid containing sugar, they probably first manufacture a certain substance which possesses the property of converting the sugar into other substances, mainly into alcohol and carbonic acid gas. The sugar in the liquid must thus gradually disappear and the sweetness be lost while alcohol is formed in its place and carbonic acid gas is given off from the liquid in the form of small gas bubbles. This, then, is the change which occurs in apple juice during the course of fermentation. The yeasts find their way into the

fresh juice in the manner previously pointed out. As they multiply, they produce the substance which acts on the sugar, breaking it up and thus reducing the sweetness, while bubbles of carbonic acid are given off, causing in the early stages of fermentation a froth to form on the surface of the liquid. At the same time, an increasing amount of alcohol is formed. Juice in this condition is commonly spoken of as "working." It increases in cloudiness considerably at this period, this being due to the large numbers of yeast plants which are formed and held in suspension in the juice. As fermentation proceeds many of the yeast plants become worn out and sink to the bottom of the vessel containing the juice, forming the lees.

Fermentation continues under favourable conditions until the whole of the sugar is destroyed. When it ceases the yeast plants sink to the bottom with the exception of a few which rise to the surface of the cider and form there a thin white layer, which is termed the "flowers." To avoid the formation of this layer, which is exceedingly troublesome in practice on account of its breaking up when the cider is disturbed, thus producing turbidity, casks of mature cider should always be filled and kept filled to the bung-hole, so that no considerable surface may be exposed, on which the "flowers" could form.

In typical alcoholic fermentation, sugar is invariably split up in such a way that 100 parts of sugar yield approximately 50 parts of alcohol. The amount of alcohol which has been formed in the cider at any given point of the fermentation can be roughly determined as follows:—The decrease of 4 points in specific gravity denotes that approximately 1 per cent. of sugar has been destroyed, which corresponds to the production of $\frac{1}{2}$ per cent. of alcohol. Thus, if a cider decreased from 1,050 to 1,022 (a drop of 28 points) approximately 7 per cent. of sugar has been lost, and $3\frac{1}{2}$ per cent. of alcohol formed.

In addition to the formation of alcohol and carbonic acid gas during the course of fermentation, it has been mentioned above that small quantities of other substances are also formed. Chief of these is glycerine. This substance is of service in aiding to give body to the fermented liquor. Other important substances also formed are various acids, which combine with alcohol during the maturing of the cider to form what are called ethers.

It is the presence of these ethers which determines largely the flavour of the mature cider.

It may be mentioned here that there are a large number of different varieties of yeasts, as distinct from one another in character as are, for example, different varieties of apples. The nature of the fermentations produced by these different kinds varies very considerably, particularly in the amounts of alcohol, glycerine, acids, and ethers formed. Consequently each kind of yeast produces a characteristic flavour, some pleasant and others unpleasant. It is, therefore, a matter of importance that cider fermentations should be conducted by yeasts of a desirable nature.

From a purely practical point of view, there are a few points which should be noted in connection with alcoholic fermentation. It has been stated above that as fermentation proceeds, many of the yeast plants become worn out and sink to the bottom of the liquid to form the lees. In course of time a considerable amount of decomposition takes place, and the products of decay are liable to give a taint to the cider. To avoid this, cider should never be allowed to remain on the lees for any considerable period of time; it should be racked off carefully into a clean barrel. Where possible, racking should be done by means of a syphon, for the reason that cider is disturbed less by a syphon than by pumping or drawing-off into pails. Consequently, the sediment is not stirred up, and comparatively little of the carbonic acid gas, which is held in solution in the liquor, is lost, since exposure to air is reduced to a minimum. It is important that as much carbonic acid gas as possible should be retained in the cider when active fermentation has ceased, on account of this gas acting as a natural preservative against many kinds of germs, which are extremely liable to produce disorders in the cider. For example, a cider in which fermentation has completely stopped, if deprived of carbonic acid gas by filtering or racking with exposure to air, will frequently turn sour owing to the action of the vinegar ferment, even though the cask containing it may be filled to the bung-hole, tightly bunged and comparatively air-tight. Therefore it is best to place the cider in the store-cask shortly before fermentation entirely ceases, so that it may become charged with

gas after the final racking has been made. This point should be carefully observed in cases where the cider is filtered, since the liquor as it comes from the filter is perfectly flat, having lost its gas. Unless sufficient fermentation takes place in the store-cask after bunging down, thus re-charging it with gas, there is a strong likelihood of some disorder developing and spoiling it.

Unfortunately, no particular rules can be given as to the proper time for racking and filtering, since different ciders vary very considerably as to the rate of fermentation, some fermenting so rapidly that all the sweetness disappears in a few weeks, while others ferment so slowly that they retain their sweetness for months. Probably the best guide is the clearing of the cider. This should be watched for carefully. When the liquid begins to grow clear naturally it is generally a sign that fermentation is coming to an end. Then is the time to rack. To rack before the clearing begins is of comparatively little use, because the cloudiness is due to the yeast plants held in suspension. They are not removed in such cases by racking, and hence fermentation proceeds after racking as vigorously as before. Similarly, if the cider be filtered before active fermentation draws to a close, unless such cider is consumed almost immediately, the filtering is largely a waste of labour, for the yeast plants quickly begin to multiply again, set up renewed fermentation, and cause the cider once more to become cloudy. At the same time, filtering is frequently of some service in such cases as a means of temporarily checking fermentation.

The same principles apply to the question as to the right time for bottling cider. In the case of bottled cider, however, the risks of disorders setting in are not so great as with cider in cask, since air is completely excluded by the cork.

This volume* contains a review of the proceedings of the Animals' Division of the Board of Agriculture and Fisheries during the year 1905 in the form of reports by the Chief Veterinary Officer (Mr. Stewart Stockman) and by the Assistant Secretary in charge of the Division (Mr. Anstruther).

* Proceedings under the Diseases of Animals Acts, 1905. (Cd. 2,893, price 1s.)

For the third year in succession Great Britain has been free both from foot-and-mouth disease and from rabies. These diseases consequently disappear from the Summary of Returns of Contagious Diseases in Animals published weekly in the *London Gazette*, in which the figures for the current period as regards diseases in animals are compared with those of the corresponding period in each of the three preceding years. At the commencement of the present year, therefore, the Returns were confined to four diseases only, namely, anthrax, glanders (including farcy), sheep-scab, and swine-fever, the figures for the year and the comparative figures for the three preceding years being as follows :—

Period.	Anthrax.		Glanders (including farcy).		Sheep-scab.	Swine-fever.	
	Out-breaks.	Animals attacked.	Out-breaks.	Animals attacked.	Out-breaks reported.	Out-breaks.	Swine slaughtered as diseased or exposed to infection.
1905 ...	970	1,317	1,214	2,068	918	817	3,876
1904 ...	1,049	1,589	1,529	2,658	1,418	1,196	5,603
1903 ...	767	1,143	1,456	2,499	1,792	1,478	7,933
1902 ...	678	1,032	1,155	2,040	1,632	1,688	8,263

A decrease in the number of outbreaks as compared with the year 1904 has, it will be noticed, taken place in respect of each one of the diseases, the outbreaks being fewer in the case of anthrax by 79, of glanders by 315, of sheep-scab by 500, and of swine-fever by 379.

Although the difficult task of reducing the prevalence of swine-fever has progressed steadily, as compared with former years, it is noticeable that the improvement in 1905 was almost entirely confined to the first half of the year, during which the outbreaks numbered 422, as compared with 798 in the first half of 1904.

Mr. Anstruther in his report describes the various administrative measures which have been taken by the Board with a view to eradicating diseases, including the regulation of the

movement of swine and the compulsory dipping of sheep for sheep-scab. In regard to the last-mentioned disease, it is pointed out that the outlook is at present hopeful, and that there is a good prospect of eliminating sheep-scab entirely within a reasonable time.

With regard to glanders, the question of granting a contribution from the Exchequer towards the expenditure which would be involved by the slaughter, with compensation, of all horses reacting to the mallein test has again been under the consideration of the Lords Commissioners of the Treasury in connection with the Departmental Estimates for the coming financial year, but it has not been found possible to provide the necessary funds in the Board's vote for the present, at any rate. In any future Order relating to this disease which the Board may find themselves in a position to make, it is contemplated that provisions shall be included regulating the movement of contact horses and the application, with the consent of the owner of the animal, of the mallein test to horses suspected of glanders, or which may have been in contact with diseased horses, and for the payment of compensation for horses slaughtered on account of definite reaction to the test, the amount of compensation payable in each case being dependent upon the results of a *post-mortem* examination conducted with a view to ascertaining whether or not the horse so slaughtered was in fact diseased at the time of slaughter. The owner of the horse or his representative would have a right secured to him of being present at such examination.

The number of outbreaks of anthrax reported in the year 1905 was 970, as compared with 1,049 in 1904. This reduction is, so far as it goes, satisfactory, but the total number of outbreaks still exceeds considerably the totals for any other year since 1887, whilst the number of counties from which anthrax has been reported has risen to the high total of 84, as compared with 77 in 1904.

The general position as regards anthrax cannot be regarded as otherwise than an unsatisfactory one, and the question of the best method of securing some substantial reduction in the prevalence of this dangerous disease has naturally been the subject of careful and anxious consideration. The reports as

to outbreaks of anthrax, furnished by Inspectors of the Board, contain a mass of useful information, which is now at the disposal of the Board's veterinary officers, and it is hoped that material for the elucidation of this difficult problem may ere long be available. The main point which has been brought more and more clearly to light by these investigations is that the existing arrangements for preliminary and confirmatory diagnosis in anthrax are not altogether satisfactory, and that some system should be evolved to meet the deficiencies which have become apparent.

The report of the Chief Veterinary Officer refers to some of the scientific questions which are the subject of enquiry at the present time, particularly, as mentioned above, the causes and diagnosis of anthrax, as well as swine erysipelas, parasitic mange, and epizootic lymphangitis.

A case of milk adulteration was recently brought to the notice of the Board by the Local Government Board for Scotland. The defendant in a milk prosecution

**Milk from
Newly-Calved
Cows.**

stated that the milk was sold exactly as it came from the cows, and that he could explain the weakness of the milk in no other way than that the milk from newly-calved cows was mixed with the milk of other cows. The Board were asked whether this liquid, known as "beastings," or colostrum, could properly be sold as milk. It is a question how long this fluid—which has a low content of butter-fat—continues to be secreted, but it seems clear that it does not assume the character of ordinary milk for at least three days after the date of the cow's calving, and the view taken by the Board of Agriculture is that the fluid in question is "not of the nature, substance, and quality of the article demanded by the purchaser," who asks for "milk," and that if it is sold without disclosure, the seller commits an offence under Section 6 of the Sale of Food and Drugs Act 1875. Milk that at all partakes of the character of colostrum should not be sold or mixed in any proportion with ordinary milk. Apart altogether from its abnormal composition colostrum cannot be regarded as an attractive food for human beings.

ADDITIONS TO THE LIBRARY DURING JUNE.

Australasia—

Queensland.—Bureau of Sugar Experiment Stations, Report for 1904-5. (43 pp.) 1906.

New South Wales.—Official Year Book, 1904-5. (810 pp.)

New Zealand.—Divisions of Biology and Horticulture, and Publications. Report for 1905. (436 pp.)

Canada—

Ontario Agricultural College.—Bull. 148:—Co-operative Experiments with Nodule-forming Bacteria. (19 pp.) 1906.

Farmers' Institutes of the Province of Ontario.—Report for 1905. Part I.: Farmers' Institutes. (144 pp.)

France—

Moussu, G.—Traité des Maladies du Bétail. (898 pp.) 1906.

Silvestre, C.—Annuaire de l'Agriculture et des Associations Agricoles. 1906. (3,017 pp.)

Germany—

Jahrbuch des Vereins der Spiritus-Fabrikanten in Deutschland, 1906. (468 pp.)

Great Britain—

Burton, P. M., and Scott, G. H. G.—The Law Relating to the Prevention of Cruelty to Animals. (170 pp.) 1906.

Thresh, J. C., and Porter, A. E.—Preservatives in Food and Food Examination. (484 pp.) 1906.

Macdonald, J.—Systems of Land Tenure. (52 pp.) 1906.

Martin-Duncan, F.—Insect Pests of the Farm and Garden. (143 pp.) 1906.

Wythes, G., and Roberts, H.—The Book of Rarer Vegetables. (109 pp.) 1906. [Handbooks of Practical Gardening. Vol. XX.]

India—

Meagher, Major D. J., and Vaughan, R. E.—Dairy Farming in India. (157 pp.) 1904.

Board of Scientific Advice for India.—Report for 1904-5.

Department of Agriculture.—Memoirs. Chemical Series. Vol. I., No. I. The Composition of Indian Rain and Dew. (11 pp.) 1906.

South America—

Martin, P. G.—Through Five Republics of South America. (487 pp.) 1905.

United States—

Farrington, E. H., and Woll, F. W.—Testing Milk and Its Products. (269 pp.) 1904.

Bureau of Animal Industry.—Circ. 95. The Fecundity of Poland, China, and Duroc Jersey Sows. (12 pp.) 1906.

Bureau of Entomology.—Bulletin 58. Some Insects Injurious to Forests. Part I. The Locust Borer. (15 pp.) 1906.

Office of Experiment Stations.—Bull. 166. Course in Cheese-Making for Movable Schools of Agriculture. (63 pp.) 1906.

Farmers' Bulletins :—

No. 255. The Home Vegetable Garden. (47 pp.) 1906.

No. 256. Preparation of Vegetables for the Table. (48 pp.) 1906.

Bureau of Soils.—Circ. 18. The Wire-Basket Method for Determining Requirements of Soils.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of June, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 11	7 7	37 8	34 9
Herefords	7 11	7 6	—	—
Shorthorns	7 8	7 2	36 10	34 0
Devons	7 11	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8	7½	8½	6½
Sheep :—				
Downs	8½	7¾	—	—
Longwools	8	7¾	—	—
Cheviots	9½	8¾	9½	8¾
Blackfaced	8½	7¾	10	9
Cross-breds	8½	7¾	10	9
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	6 10	6 5	6 5	5 10
Porkers	7 3	6 10	7 2	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	19 19	16 14	21 3	17 10
„ —Calvers ...	19 14	16 11	19 6	16 0
Other breeds—In Milk ...	17 9	13 11	17 17	14 18
„ —Calvers ...	15 0	11 15	17 15	15 0
Calves for Rearing	2 3	1 14	2 11	1 14
Store Cattle :—				
Shorthorns—Yearlings ...	8 15	7 12	10 0	8 11
„ Two-year-olds ...	12 14	11 2	13 15	12 6
„ Three-year-olds ...	16 10	14 9	16 6	13 9
Polled Scots—Two-year-olds	—	—	14 12	12 14
Herefords— „	14 15	13 7	—	—
Devons— „	11 8	10 9	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	40 8	34 11	—	—
Scotch Cross-breds ...	—	—	43 1	36 8
Store Pigs :—				
Under 4 months	31 3	24 1	28 6	20 4

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of June, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF:—							
English	1st	53 6	51 6	52 0	—	53 6*	54 6*
	2nd	51 6	46 6	47 0	—	—	48 0*
Cow and Bull	1st	—	43 6	44 6	39 6	42 0	42 0
	2nd	—	38 6	39 0	35 6	32 6	36 6
U.S.A. and Cana- dian:—							
Birkenhead killed	1st	48 6	49 0	47 0	47 0	48 0	47 0
	2nd	44 6	45 0	45 0	44 6	—	—
Argentine Frozen—							
Hind Quarters ...	1st	31 0	32 0	32 0	31 0	32 6	33 6
Fore „ ...	1st	22 0	24 0	23 6	23 6	24 6	23 6
Argentine Chilled—							
Hind Quarters ..	1st	36 0	39 0	36 6	36 6	—	39 0
Fore „ ...	1st	23 6	27 0	26 0	26 0	—	26 6
American Chilled—							
Hind Quarters ...	1st	52 0	52 6	52 0	51 6	53 0	53 6
Fore „ ...	1st	31 0	32 0	32 0	32 0	32 0	32 6
VEAL:—							
British	1st	64 0	60 6	67 6	73 6	—	—
	2nd	58 6	51 6	62 6	67 6	—	—
Foreign	1st	66 6	—	—	—	—	59 0
MUTTON:—							
Scotch	1st	80 6	—	80 0	79 6	85 6	82 0
	2nd	76 6	—	74 6	75 0	74 0	65 6
English	1st	72 6½	70 6	75 0	71 0	—	—
	2nd	64 6	57 6	70 0	66 6	—	—
U.S.A. and Cana- dian:—							
Birkenhead killed	1st	—	—	—	73 0	74 6	—
Argentine Frozen ...	1st	31 6	34 0	36 0	36 0	34 0	35 6
Australian „ ...	1st	31 6	32 0	31 0	32 6	34 0	—
New Zealand „ ...	1st	39 0	36 6	39 6	39 0	34 6	—
LAMB:—							
British	1st	85 0	80 0	80 0	81 0	90 6	93 6
	2nd	77 0	72 6	74 0	74 6	79 6	86 6
New Zealand	1st	46 6	49 0	46 0	46 0	49 0	50 6
Australian	1st	37 6	41 6	39 6	39 6	40 0	—
Argentine	1st	—	40 6	—	—	40 0	39 6
PORK:—							
British	1st	59 6	61 0	56 0	56 6	57 0	52 6
	2nd	55 0	56 0	50 0	49 6	53 6	46 6
Foreign	1st	58 6	58 0	58 6	58 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (in 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21 ...	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28 ...	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5 ...	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12 ...	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19 ...	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26 ...	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2 ...	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9 ...	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16 ...	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23 ...	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30 ...	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7 ...	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	0
" 14 ...	26	10	32	3			18	9	23	10			17	6	19	7		
" 21 ...	27	7	32	2			18	10	23	7			17	6	18	11		
" 28 ...	28	0	32	3			19	9	23	11			17	10	19	3		
Aug. 4 ...	28	3	31	11			19	9	22	0			17	10	18	4		
" 11 ...	28	4	30	5			19	9	22	5			17	7	16	11		
" 18 ...	28	8	28	5			22	5	23	4			16	7	16	4		
" 25 ...	29	5	27	1			23	2	23	6			16	5	15	9		
Sept. 1 ...	30	2	26	11			25	3	23	5			16	3	15	9		
" 8 ...	30	0	27	1			24	10	23	4			16	1	15	11		
" 15 ...	29	7	26	11			24	9	23	7			15	11	16	0		
" 22 ...	29	10	26	8			25	10	23	10			15	9	15	11		
" 29 ...	29	10	26	9			25	5	24	3			15	8	16	1		
Oct. 6 ...	30	2	26	9			25	6	24	9			15	9	16	3		
" 13 ...	30	5	26	11			25	4	24	10			15	8	16	6		
" 20 ...	30	4	27	1			25	5	25	0			15	11	16	7		
" 27 ...	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3 ...	30	6	27	10			25	0	24	9			16	0	17	1		
" 10 ...	30	3	28	3			24	6	24	10			15	11	17	4		
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	6	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: February ...	39 11	40 0	23 8	25 1	18 10	22 1
March ...	39 10	39 10	24 0	25 2	19 4	22 3
Paris: February ...	40 3	40 4	24 4	25 2	19 9	22 8
March ...	40 2	40 6	25 0	25 3	19 11	23 2
Belgium: March ...	30 10	30 3	23 8	24 6	20 6	21 5
April ...	30 8	30 6	23 10	24 7	20 5	21 7
Berlin: April ...	37 6	39 9	—	—	19 8	23 4
May ...	38 2	40 4	—	—	19 9	23 4
Breslau: April ...	{ 35 7	35 8	26 5	27 9 (brewing) 25 1 (other)	19 8	21 4
May ...	{ 35 3	35 8	25 7	27 9 (brewing) 25 1 (other)	19 4	21 3

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of June, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	32 2	31 2	22 5	23 6	19 11	20 10
Norwich ...	31 6	30 3	20 6	19 6	18 1	19 4
Peterborough ...	31 2	30 1	—	23 5	19 2	19 9
Lincoln ...	29 11	29 6	—	22 8	18 10	19 6
Doncaster ...	29 9	28 10	—	—	18 0	20 3
Salisbury ...	31 2	30 5	24 9	22 6	19 2	20 1

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of June, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
BUTTER :—								
British... ..	12 0	11 0	—	—	—	—	12 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	104 6	—	104 0	102 0	103 0	99 6	102 6	94 0
Danish	111 6	109 6	111 6	108 0	111 0	108 0	111 0	—
Russian	97 6	94 6	104 6	101 0	97 0	94 0	96 6	92 0
Australian ...	100 6	97 0	—	—	—	—	98 0	96 0
New Zealand...	104 6	101 6	—	—	103 0	100 0	104 0	—
CHEESE :—								
British, Cheddar	68 6	66 6	—	—	73 0	70 0	60 0	57 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	58 0	53 5	61 6	56 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	60 6	59 0	59 0	57 6	55 6	53 0	57 6	55 6
BACON :—								
Irish	67 0	64 6	69 0	67 0	66 0	63 0	65 6	63 0
Canadian ...	63 0	—	61 0	57 6	61 0	57 6	62 6	60 6
HAMS :—								
Cumberland ...	106 0	96 6	—	—	—	—	—	—
Irish	104 0	96 6	—	—	—	—	100 0	94 0
American (long cut) ...	60 6	59 6	61 6	57 0	61 6	56 6	61 0	58 0
EGGS :—								
	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	10 0	8 4	—	—	—	—	—	—
Irish	9 1	—	7 11	7 6	7 8	7 1	7 4	6 10
Danish	9 4	8 5	9 3	7 3	—	—	8 4	7 10
POTATOES :—								
	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	60 0	53 6	—	—	75 0	70 0	45 0	40 0
Scottish Triumph...	—	—	54 6	45 6	63 6	58 6	—	—
Up-to-Date ...	66 0	53 6	66 0	56 0	61 6	53 6	40 0	35 0
HAY :—								
Clover... ..	89 0	79 0	105 6	93 6	100 0	77 6	94 6	85 0
Meadow	81 0	70 6	99 0	83 6	—	—	92 6	83 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	129	105	634	422
Swine Slaughtered as diseased or exposed to infection ...	859	514	3,440	2,024
Anthrax:—				
Outbreaks	93	89	523	535
Animals attacked	119	112	771	750
Glanders (including Farcy):—				
Outbreaks	114	128	570	627
Animals attacked	192	184	1,054	1,087
Sheep-Scab:—				
Outbreaks	9	12	287	643

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		6 MONTHS ENDED JUNE.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	20	18	49	46
Swine Slaughtered as diseased or exposed to infection ...	157	137	594	466
Anthrax:—				
Outbreaks	1	—	3	2
Animals attacked	5	—	7	2
Glanders (including Farcy):—				
Outbreaks	—	3	3	12
Animals attacked	—	8	10	33
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	6	7	146	222

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THE SPREAD OF FUNGUS DISEASES BY MEANS OF HYBERNATING MYCELIUM.

Until recently it was assumed that fungi could only be reproduced by means of spores, the equivalent of seeds in the higher plants. As exceptions to this general statement it has long been known that in certain instances, concentrated masses of mycelium termed sclerotia, could give origin to a new fungus independent of spores, but such instances were not common. It was also known that the mycelium of some kinds of fungi travel for a considerable distance in the soil from the point of origin, and under favourable conditions produce new plants far away from the parent stock.

Apart from such exceptions, all endeavours to arrest the extension of parasitic fungi injurious to cultivated plants, has turned on some method of destroying the spores. This line of treatment assumed that the plant to be protected was free from disease, until infected from without by means of spores.

Recent research has shown this assumption to be too general, and has proved on the contrary that in the case of many of the most destructive fungi, spores play a very subordinate part, and in some instances no part whatever, in continuing a disease from one year to another. In such cases the perpetuation of the fungus is insured by the presence of mycelium in the seed, tuber, bulb, or whatever part of the plant is used for reproduction. More than this, it is known that when once some plants are infested, the mycelium present in the seed or tuber, as the case may be, not only spreads along with the growing plant, but also enters the new seeds or tubers and consequently the offspring of

that plant is infected for all time. The discovery of this means of perpetuating a disease by mycelium present in the reproductive portion of the host-plant fully explains the failure to check certain diseases by spraying or other measures, where the idea was to destroy spores or prevent their entering the plant on germination. The same discovery also strongly suggests the probability that many sudden outbreaks of fungus-epidemics, attributed to the rapid production and diffusion of spores, may not in reality be due to spores at all, but to the presence of hybernating mycelium which, favoured by certain weather conditions, extends rapidly through the host-plant and causes an epidemic.

Infection by means of spores dispersed by wind, insects, or other external agents, is the oldest and most general method by which fungi maintain their continuance in time, and also extend the area of their distribution. The more specialized and less general method of securing these two objects, by means of hybernating mycelium passing directly from one generation of the host-plant to another is equally certain in its results, and at the same time more economical; when the balance between fungus and host-plant is fully established, as in the rye-grasses, the production of spores is no longer necessary.

The following illustrations of infection and dispersal of fungi, by means of hybernating mycelium in the reproductive portion of the host-plant, furnish examples of the various phases in the evolution of this method, which may be grouped under three heads.

1. The simplest or least differentiated stage, where both spores and hybernating mycelium in the seed are necessary.

This illustrates the most primitive attempt to perpetuate a species by means of hybernating mycelium; the older method by means of spores is still necessary, and plays an indispensable part in the process.

Examples.—"Smut" caused by species of *Ustilago*, in some cereals and other grasses.

2. Hybernating mycelium alone is capable of perpetuating the parasite from year to year. Spores however continue to be produced, and by infecting other host-plants extend the geographical area of the fungus.

Examples.—"Potato blight" caused by *Phytophthora infestans*, De Bary, and potato "leaf-curl" caused by *Macrosporium solani*, Cooke.

3. Hybernating mycelium located in the seed is alone present, the production of spores being completely arrested.

This phase illustrates the perfection of the method of infection and distribution of a fungus by means of hybernating mycelium; the older method by means of spores being completely obliterated.

Examples.—Darnel, rye-grass, Italian rye-grass. Owing to the absence of fruit, the affinities of the fungus cannot be determined.

It has generally been assumed that the infection of cereals by "smut" (*Ustilago*) spores, could only be effected during the youngest seedling stage of the plant. Such infection was considered to be due to spores present in the soil, or more generally by spores adhering to the "seed" and consequently sown along with it. As a preventive against such infection it is the common practice to treat "seed" before sowing with a solution of sulphate of copper, formalin, or some other fungicide. Such treatment sometimes proves beneficial, sometimes not.

Brefeld, a German mycologist, whose researches on the "smuts" (*Ustilago*), "bunts" (*Tilletia*), and other groups of fungi are well known, has recently published the results of his investigations on the infection of cereals and other plants by "smut" spores. Without entering into minute details it may be stated that Brefeld has proved, as the result of an elaborate series of experiments, that in the case of wheat, barley, and some other plants of no economic importance, infection takes place through the flower, and not during the seedling stage in the ground. "Smut" spores carried by wind, insects, or in the case of aquatic plants by water, are deposited on the stigma of the flower, where they germinate and pass down into the ovary or young seed.

There an amount of hybernating mycelium is formed which remains in a resting condition until the seed is sown, when the fungus grows along with the plant, and finally produces the well-known sooty masses of spores in the seed.

Other plants, including oats, are only infected during the seedling stage in the ground; others again are infected by both

methods. This is what would be expected during the early stage of evolution of a new mode of infection. In these examples the hybernating mycelium has become differentiated, but its presence depends on infection by spores. In this condition it will be observed that infection occurs one generation before the fungus manifests itself by the production of spores.

Practical men are well aware that by proper treatment of the seed with a fungicide, "smut" in oats can be reduced to a minimum, whereas "smut" in barley cannot be prevented by the same treatment. Brefeld's investigations have furnished the explanation. "Smut" in oats is the result of infection during the seedling stage in the ground, consequently by treating the seed the adhering smut spores are destroyed and infection prevented. On the other hand barley being infected through the flower, treatment of the seed could not have any beneficial result. The fungus was present in an advanced condition, in the form of mycelium within the seed, and not in the form of spores adhering to the surface, when the barley was sown.

Many potato growers have for some time past felt that infection by spores alone appeared inadequate to account for the sudden outbreak of an epidemic of potato disease, *Phytophthora infestans*, De Bary, appearing simultaneously over a considerable area. Various experiments have been conducted at Kew with the object of determining the different modes of infection of potato tubers. The following among others is considered as affording definite evidence as to the existence of hybernating mycelium of *Phytophthora* in the tubers, capable of imparting the disease to the offspring of the infected tuber.

Three tubers showing rusty stains in the flesh, indicating the presence of mycelium of *Phytophthora*, were each cut into two equal parts. Each half tuber was planted separately in a plant pot. The soil and manure used was of the same kind for all, and was sterilized by steam. Three of the pots were placed in a house having a temperature ranging between 70 deg. and 80 deg. Fahr., and very often with moisture at saturation point. Each pot was placed under a bell-jar. The three remaining pots were placed in a house without any artificial heat, and having the air exceptionally dry. These pots were not placed under bell-jars. An equal amount of water was supplied to

each of the six pots. The three plants grown under conditions of high temperature and much moisture grew quickly. The *Phytophthora* first appeared when the shoots were six weeks old, and a fortnight later all three plants were blackened and destroyed by fungus. The three plants grown in the cool dry house showed no trace of disease at the end of two months. At this time one of the plants was removed from the cool to the hot, damp house, and placed under a bell-jar. Within nine days this plant was blackened and killed by the fungus. A fortnight later a second plant, showing no evidence of disease, was removed from the cool to the hot, damp house, and placed under a bell-jar. Within a week this plant was also killed by a copious growth of *Phytophthora*. The third plant was kept for thirteen weeks in the cool house, and remained perfectly free from *obvious* disease.

Similar results were obtained by using potato tubers produced by a plant badly infested with "leaf-curl," (*Macrosporium solani*, Cooke), thus proving that in this disease also a perennial mycelium is present in the tuber, capable of communicating the disease to its offspring.

Although hibernating mycelium is present in infected potato tubers, capable of perpetuating the disease from one generation to another, spores are as yet produced in great profusion, and probably inoculate many previously sound plants. This is why spraying potatoes is of service if properly conducted: it protects the crop to the extent it would have suffered from inoculation by spores, but is of no avail in protecting it from the amount of disease originating from hibernating mycelium.

The above experiments, with others conducted at Kew, prove clearly another point of considerable importance, namely, that the appearance of an epidemic of fungus disease depends almost entirely on weather conditions. Epidemics are fortunately sporadic in their appearance, and are not dependent on the influx of an excessive number of spores. Disease is always present to some extent, and in all probability there is always a sufficient number of spores present to start an epidemic, if conditions proved favourable. From this it follows that spores and host-plants in juxtaposition are of themselves not sufficient to set up an epidemic. Another factor is also absolutely

necessary ; that factor is suitable weather. The practical potato grower can predict with almost unerring certainty the advent of potato disease, the indication being what he terms "stuffy" or "blighty" weather, which being interpreted, means damp, dull warm weather. The same conditions are illustrated on an exaggerated scale in the experiment with potatoes described above, in the warm, imperfectly-lighted, damp house. On the other hand the potatoes in the cool, dry, well-lighted house, although proved to be infected, remained perfectly free from disease in an *obvious* form. So with crops on a large scale ; no one ever saw an epidemic of wheat rust, or of any other crop during bright clear weather, yet this does not prove that the plants were free from the germs of disease, but that such germs were held in abeyance by the weather conditions favourable for the growth of the host-plant, which conditions are those most unfavourable for the fungus.

It will probably be proved in course of time, that a sudden outbreak of potato disease and other epidemics is not always primarily due to infection by spores,—where are these spores to come from if there has been no previous evidence of disease?—but rather to a sudden stimulation of mycelium already in the plants, and only awaiting suitable conditions before assuming an aggressive attitude. It is generally admitted that parasitism in fungi is an acquired habit. This being so, as would be expected, there are many degrees of parasitism ; some fungi have become so highly differentiated as parasites that they can only attack one particular kind of plant, or even only one variety of a plant. In cases of parasitism, the advantage is all in favour of the parasite, which lives entirely at the expense of the plant attacked, the latter deriving no benefit from the presence of the parasite.

In the potato disease the parasite is very destructive in its work, during a severe attack completely destroying every portion of the host-plant within a few days of its appearance. In the case of cereals, the fungus, although yet a parasite, behaves in a very different manner, whether infection takes place through the flower or in the seedling stage in the ground ; the fungus grows up with the plant in its tissues for six months or more, without causing any apparent injury or inconvenience ;

on the other hand, infected plants are more robust and vigorous than uninfected ones, suggesting that the amount of food required by the parasite stimulated the host-plant to exercise greater activity in the matter of obtaining food. However, when the plant has reached the flowering stage, the fungus present in its tissues assumes an aggressive attitude, its mycelium enters the young ovaries and in place of seed produces its black, powdery mass of spores.

In many instances the relation between parasite and host-plant has become so thoroughly adjusted that no injury is experienced by either; on the other hand, mutual benefit is derived from the combination. Such a condition of things is termed symbiosis, a remarkable instance of which has been described by Freeman as existing between fungi and three kinds of rye-grass respectively, *Lolium temulentum*, L., *L. perenne*, L., and *L. italicum*, A. Br. The life-history has been followed in *L. temulentum* or darnel, and briefly is as follows:—The mycelium of the fungus is present in the seed on germination; this mycelium commences growth and keeps pace with the host-plant, finally again entering the seed, where it remains in a resting condition until germination takes place, when the same round is repeated. A series of experiments showed clearly that infected plants were more vigorous than uninfected ones. So certain is the fungus of perpetuating itself by this vegetative method without ever leaving the host-plant, that the production of spores has been completely arrested, hence the affinities of the parasite cannot be determined.

In the absence of spores no other plants of the same kind can be infected, consequently there are two races of each of the three rye-grasses, one infected or in symbiotic connection with a fungus, and one race not, and without the possibility of becoming so. Microscopical examination of a commercial sample of the seed of darnel, showed that over 80 per cent. were infected.

Many other instances could be given where disease is perpetuated from one generation of plants to another, due to the presence of hibernating mycelium, but perhaps sufficient has been stated to prove that this subtle method of transmitting

disease is at work, and plays a prominent part in the spread of some of the most dreaded of fungus diseases.

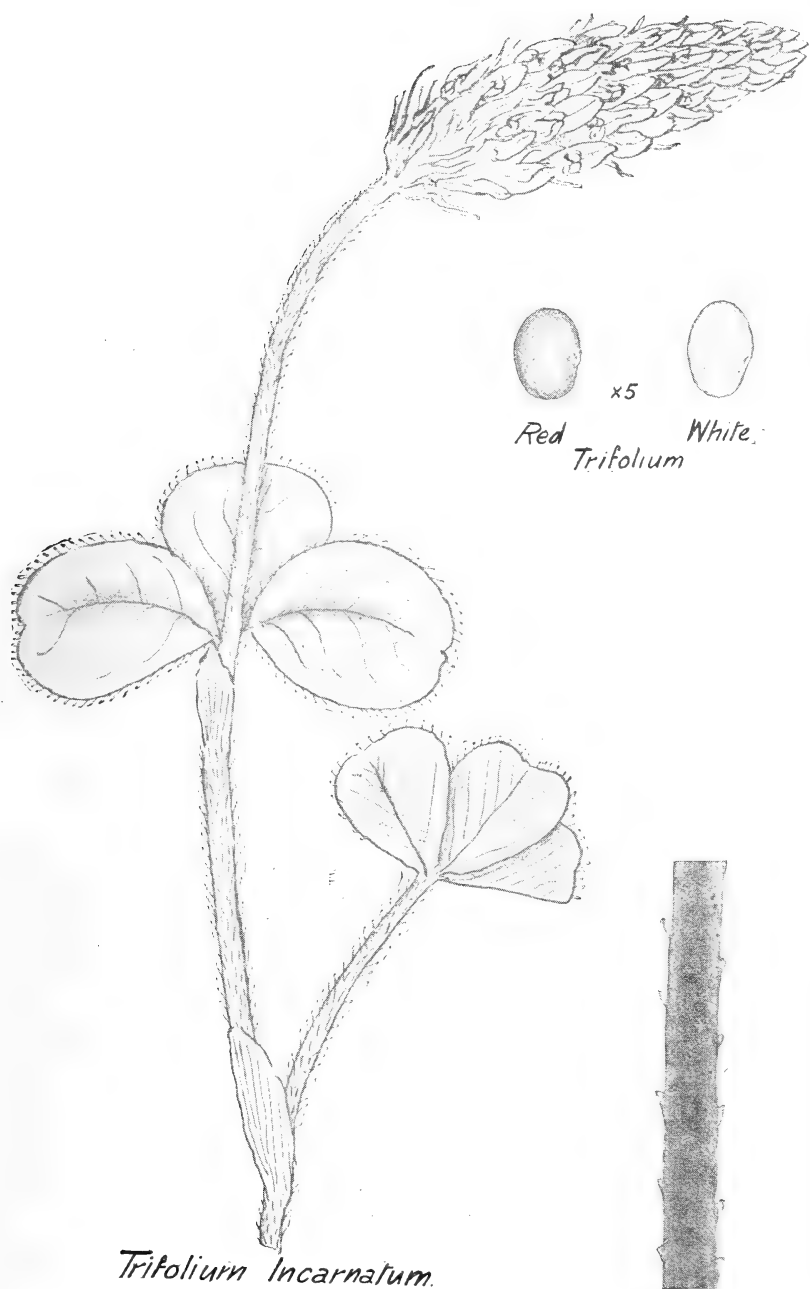
The above discoveries, indicating hitherto unsuspected methods of perpetuating and diffusing fungus diseases, may at first sight appear to the practical man, who naturally desires a cure for every ill, as anything but reassuring. This, however, is not the case; before any certain method of prevention can be formulated, we must be in possession of all the facts that render such prevention necessary. At all events these discoveries have clearly indicated the futility of treating barley seed for the prevention of smut, when it is known that infection takes place in the flower, and have shown the great risk incurred in using seed, tubers, bulbs, &c., produced in an infected area, in the case of those plants known to be capable of perpetuating a disease by means of hibernating mycelium.

TRIFOLIUM INCARNATUM.

Italian or Crimson Clover.

In the economy of the farm the members of the family *Leguminosæ*—and in particular the genus *Trifolium*—offer to the farmer a somewhat wide range of valuable fodder crops, varying perhaps in their feeding value, but well suited by their diverse characteristics for different purposes and soils. Among seed-merchants both at Mark Lane and in country markets and also among the farming community, the generic name “*Trifolium*” is, however, commonly applied to the species *Trifolium incarnatum* or Crimson Clover.

Crimson Clover is a native of the South of Europe, and was introduced as a field crop into this country some time about the second decade of last century. It was about that time that Sir John Sinclair encouraged, or at least interested himself in, its culture in Scotland. Afterwards it was grown in many parts of England with more or less success. Previous to its introduction as a field crop, and doubtless owing to the size and beauty of the flower head, horticultural writers and gar-



Trifolium Incarnatum.

FIG. 1.—TRIFOLIUM INCARNATUM,
WITH SEED.

FIG 2.—SINGLE HAIR, SHOWING
ITS SPINY OR BARBED CHARACTER
(magnified 300 diameters).

dening experts of even an earlier period set a high value upon *Trifolium* as an ornamental and showy border plant. Owing to its peculiar climatic requirements Crimson Clover is most suc-

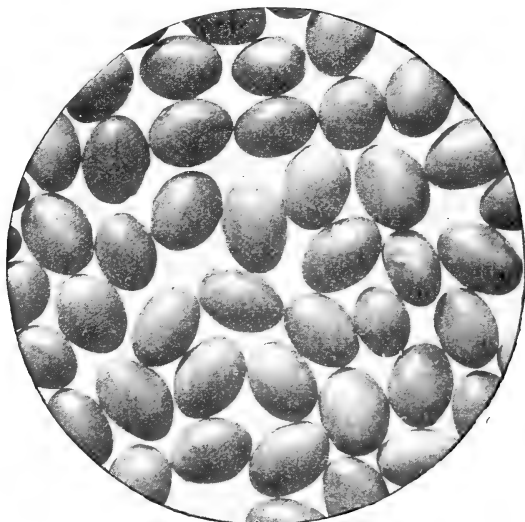


FIG. 3.—SEED OF CRIMSON CLOVER (magnified five diameters).

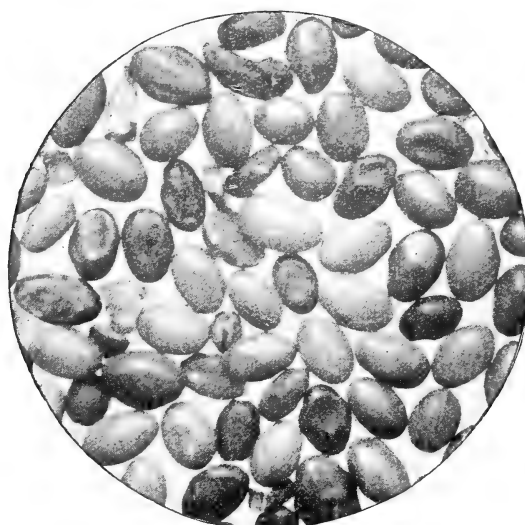


FIG. 4.—LOW-GRADE SAMPLE OF CRIMSON CLOVER SEED (magnified five diameters).

cessfully grown in the Southern counties of England, where it is usually cultivated as a catch crop. It is an erect-growing annual, from one to two feet high, and its habit of growth, hairy appearance, and bright crimson, oblong flower-heads are

sufficient to distinguish it from all other species of the same genus.

In districts and soils suited to its growth, farmers seldom omit the laying down of a certain breadth of Trifolium. The inducement to do so is apparent when one takes note of the economy of its cultivation and the rapidity of its growth, resulting in an early bite for stock, or in a crop which can be cut for horses and cattle at a period when green food is scarce.

The maximum yield of Trifolium is only obtained on warm,

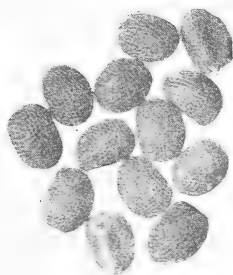


FIG. 5.—GERANIUM DISSECTUM (magnified five diameters).



FIG. 6.—GERANIUM MOLLE (magnified five diameters).

loamy, and gravelly soils. On colder land and in later districts it is sown much less frequently, as autumn rains and winter frosts prevent anything like successful results. As soon as the corn crop is removed, the cultivation for this clover should be immediately taken in hand. The preparation for the reception of the seed consists in working the surface with heavy drag harrows, so that the necessary tilth for covering the seed may be obtained without loosening the soil to too great a depth. The seeds are sown on the scarified surface, again harrowed, and rolled firmly in. It is absolutely essential to its

successful growth that the seed should be sown on a firm and solid bottom. More often than not, if failure results it is caused by a lack of firmness, and even on soils of a heavier nature, when ploughing is resorted to, the growth is not quite so successful as when the harrow only is employed.

When sown in August as described, at the rate of 20 to 25 lb. of seed per acre, this crop grows rapidly, and becomes well established and firmly rooted, so as readily to withstand the severity of the winter, and will yield a large crop, to be cut or fed off in the following May or June. The exact quantity of seed to be sown is somewhat dependent on whether the conditions for successful growth are favourable or otherwise. The larger quantity would of necessity have to be used should the conditions of climate or soil be adverse. If one may give a time in which this useful plant may be sown, it might be given as ranging from the first week in August until about the 10th of September, and, as a general rule, the earlier the better.

There are, at least, three varieties of *Trifolium* in commerce: early, medium, and late, as well as the white-flowered variety. They are all useful plants. In practice, it is usually desirable to sow a certain breadth of each; and, though sown at the same time, these varieties come into use at different times in the spring, thus producing a useful succession of food. When the ordinary clovers are seriously affected by the drought of summer, or weakened or killed by severe winter frosts, the bare spots may be successfully renovated by sowing a few pounds of *Trifolium*.

As a hay crop *Trifolium* is not successful, for it is usually more stemmy than leafy; but if it is to be made into hay it should be cut directly the flower-head appears, for, as the plant reaches maturity, the stem gets tough and woody, and, in consequence, serious danger to live stock consuming it may be apprehended.

Some idea of the danger following the feeding of mature *Trifolium* may be gathered from observing closely some of the micro-photographs illustrating this article. In Fig. 11 the writer has depicted a single mature floret, five times life size. The whole of the flower-head from which the floret was taken was a little over three inches long, and its extreme hairiness can

be imagined, as it contained 172 florets similar to the one depicted.

On several occasions during recent years the writer has had occasion to examine microscopically hair balls removed from the intestines of sheep and horses, which have, by causing an obstruction, been the cause of death.

In appearance the hair ball has the look of a lump of smooth dried clay, but, on handling it, its extreme lightness is noticeable, and, when closely examined, it has been found to



FIG. 7.—*GERANIUM MOLLE* (without husk) (magnified five diameters).



FIG. 8.—*FIELD MADDER* (magnified five diameters).

be composed of minute hairs. These hairs, when teased out and put under the microscope, proved to be identical with the hair of the mature flower-head of the *Trifolium*. These hairs are serrated or barbed (see Fig. 2), and in consequence of the movement of the food in the stomach, become felted and form balls.

In this connection the result of an inquiry made on behalf of the United States Government into the death of several horses is of interest. The report says:—"When the hair balls have once developed to such a size that they cannot pass through the intestines no practical remedy can be suggested, but

the prevention of the difficulty is easy. The hairs of Crimson Clover do not become stiff until the plant has passed the flowering stage and begun to ripen ; it should be a rule, therefore, never to feed Crimson Clover after the crop has ceased flowering, and especially never to follow the pernicious practice of feeding stock with the straw of Crimson Clover, raised and thrashed as a seed crop. By guarding against improper methods of feeding, there is no reason why Crimson Clover should not continue to maintain its well-merited reputation."

Some two or three years ago investigations of a similar nature were carried out by Drs. Bernard Dyer and Voelcker, and resulted in the same conclusions.

The seeds of *Trifolium incarnatum* are quite distinct, both in colour, size, and shape, from other species of *Leguminosæ* discussed in previous numbers of the *Journal*. Seeds recently harvested and in good condition are of a yellowish colour, somewhat tinged with red, or varying from a light to a reddish yellow, oval or elliptical in shape, and when fresh and new are bright and polished, with a smooth surface, and very much larger than the seeds of Red Clover. In the micro-photograph of a group of the seeds of Crimson Clover the uniformity of shape and size of grain in a good sample is well shown (Fig. 3). A very poor, low quality sample is also illustrated (Fig. 4), where the great variation in the colour and uniformity of the seeds is noticeable. Good commercial seed should be at least 95 per cent. pure, and, by paying a fair price, there is no difficulty in obtaining seed having a purity of 98 per cent., or perhaps even higher. The germinating capacity of fresh new seed of good quality rarely falls below 90 to 95 per cent.

The seed of White Trifolium, although larger in size than the red, is less uniform, both in shape and size. It is very easily recognised by its shape and colour, for, instead of being yellow tinged with red, it is of a bright cream white. In many samples the lack of lustre, combined with darkening of colour, is, in a great measure, sufficient evidence that advancing age has robbed the once living and robust germ of its vitality.

Some of the impurities found in Trifolium samples are shown magnified to the same scale, viz., five diameters in each case.

Those illustrated are two species of Crane's-bill (*Geranium dissectum* and *Geranium molle*) (Figs. 5, 6 and 7), Field Madder (*Sherardia arvensis*) (Fig. 8), Corn Gromwell (*Lithospermum arvense*) (Fig. 9), and Curled Dock (*Rumex crispus*) (Fig. 10).



FIG. 9.—CORN GROMWELL
(magnified five diameters).



FIG. 10.—CURLED DOCK
(magnified five diameters).

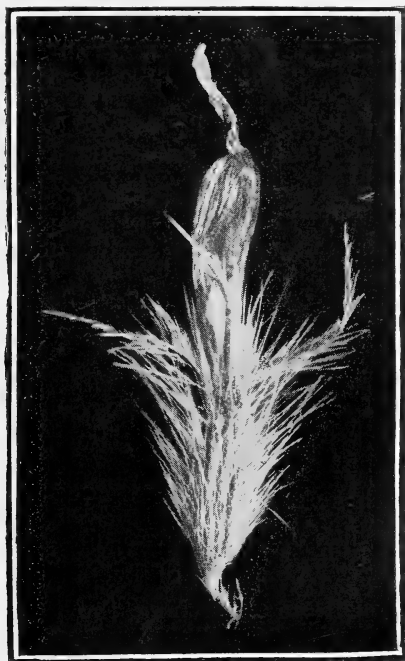


FIG. 11.—FLORET OF CRIMSON CLOVER (magnified five diameters).

Samples that lack lustre usually contain a considerable proportion of immature grains, and, in consequence, the germinating energy is weak, the total vitality being below the standard of good-marketable seed.

D. FINLAYSON.

POULTRY-YARD FITTINGS.

The necessary fittings of the poultry house and yard are briefly :—Roosts or perches, nest boxes, feeding troughs, watering vessels, boxes to contain grit, shells, &c., and dust boxes. The roosts must be moveable; this is essential, for if the roost is a fixture the difficulty of cleaning the house is increased, and is liable to be neglected in the busy seasons, when cleanliness is most necessary. The old ladder-shaped roost is now but little used, although it has some good and some bad points. Its principal fault is that the fowls crowd too much on the top perch, and in trying to find a place there the stronger birds hustle the weaker ones off the perch, and the latter may be hurt by falling to the ground. Moreover, the fowls may injure themselves by flying off the high perches when leaving the roost, and this is a fruitful cause of bumble-foot and similar affections. The style of roost which has superseded the ladder-shaped one consists of a series of perches laid level at a height of about two feet from the ground, so that they will not interfere with the ground room of the house. For the ordinary flock of thirty or forty hens, two or three perches extending from one wall of the house to the other, at the side farthest from the door, are sufficient to accommodate that number of birds, as it is not necessary to give more than ten or twelve inches of perch to each fowl. But plenty of air space must be allowed, and for fowls of average size the regulation space recommended is ten cubic feet to each bird. Consequently the perches should not occupy the whole of the house, and the portion which is nearest the door may be utilized for some other purpose. One way of keeping a tidy house and preventing the hens from scratching the litter and manure all over the floor is to keep the roosts at the back of the house, and to divide that part of the floor which is under them from the front portion by placing a board on its edge across the floor. The front part of the floor can then be covered to a depth of four or five inches with light short litter, and can be used as a scratching shed, and the nest boxes, grit boxes, &c., can be placed here. Some farmers who divide the house in this way put a load or two of sand in the front portion, and then throw

a few shovelfuls of this under the roost every morning. In this way the excrement is covered up and partly absorbed, and thus rendered odourless, so that the floor beneath the roost need not be cleaned out oftener than once a month. It is not necessary that the two sections of the floor should be divided by a board if the door and the windows are all in the front of the house, because hens invariably scratch with their heads towards the light, and hence they throw a certain quantity of the outside litter back under the roosts every day.

Perches.—When the perch extends from one side or end of the house to the other it may rest simply on strips of wood about one

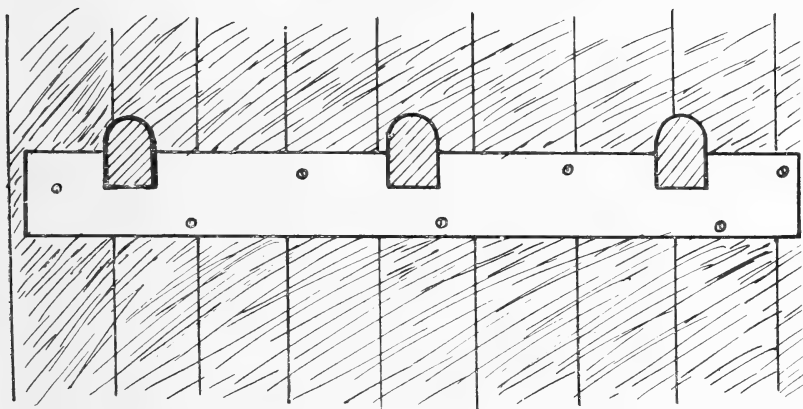


FIG. 1.—SUPPORT FOR ENDS OF PERCHES, SCREWED TO WALL.

and a half inches thick and four inches deep, having square notches cut in them to hold the end of the perch, and these may be fastened to the walls of wooden houses by screwing them in in the manner shown in Fig. 1. It is not necessary to have a support in the middle, even though the perch is twelve or fourteen feet long, provided the perch is of fair substance and of proper shape—deeper than it is wide. Opinions differ greatly as to the most desirable shape of perch, and the class or breed of fowl must be taken into account.

Heavy fowls require a wider perch than light ones, and for birds of the average farm class—say, Wyandotte size—a roost two and a quarter inches wide is suitable. If the length of a perch of this thickness were twelve feet, it would need to be five inches

deep to prevent sagging, but for shorter lengths the depth may be from three and a half to four and a half inches. Perches of this scantling must not be laid flat unless they are very short or are supported in the middle. The half-round perch is still found in many modern houses, and it is undoubtedly a good shape. Rough poles split in halves, with the bark left on, are not suitable, as they harbour insects, and it is impossible to keep them clean. The rectangular perch may be improved by having the upper corners slightly rounded off with a plane. It is advisable that all perches should be planed smooth so that the irregularities which remain in the wood after it is sawn may not hold dirt and insects.

The importance of having moveable fittings cannot be over-estimated, not only for the reasons already mentioned, but also because it is impossible to fight against an outbreak of disease or a plague of insects if everything within the house is not capable of being easily moved.

The roost described is of the plainest and simplest type, but for practical purposes it is as good as any. With the object of preventing the attacks of vermin several plans have been proposed, but the strictest cleanliness can be maintained if the roosts are of the simple kind described. Roosts are also made with divisions to prevent overcrowding, but these have proved cumbersome and have met with little favour.

Nest Boxes for Laying-Hens.—These may be placed either within the roosting house or outside it, and their position must be determined by circumstances. If the house is commodious, with plenty of room in front of the roost, there is nothing to be said against placing the boxes along the front wall, as the hens will go into such a house in the day time to lay. If there is a scratching shed attached, it is always preferable to place the nests in this shed, because it is the natural place of resort for the hens in the day time, and they will lay there more readily than elsewhere; but in this case there should be a connecting door between the house and the shed, so that the hens have access to the nests at all hours.

During the summer months, when hens are laying freely, it may not be easy to arrange enough nests within the house to accommodate all the layers without taking up too much floor

space, and in this case it is advisable to place a few nesting boxes in the runs. Hens have a natural inclination to lay out of doors when the weather is favourable, and it will be found that they prefer outside to inside nests. A convenient plan for outside nests is to procure some half-barrels, *i.e.*, barrels of any size sawn in halves, and to put them side by side near a wall in a secluded place. These can then be covered by a shelter made of corrugated iron sheets or of boards, set on a light frame, so that the hens have room to reach the nests and to leave them at will. A few outdoor nests of this kind will accommodate a large flock of hens if the barrels are of fair size, for several hens will make use of one nest.

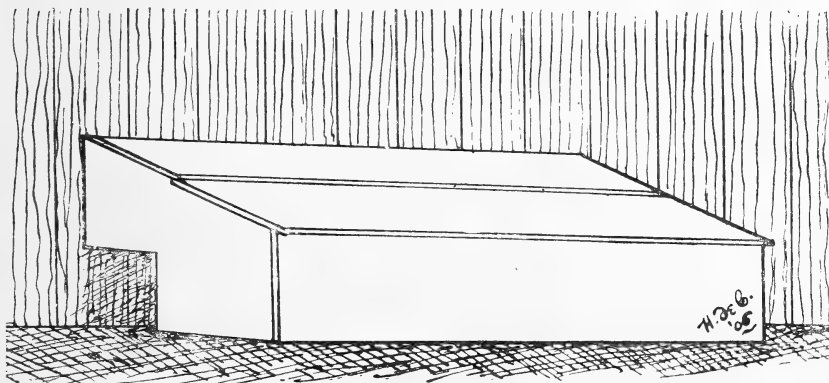


FIG. 2.—NEST BOXES, FACING WALL, ENTRANCE AT ENDS.

The number of nests required to accommodate a flock of laying hens depends very much on the birds, but as a rule three or four commodious nest boxes will suffice for a dozen hens, but this number may not be enough if the hens are quarrelsome, or if they frequently become broody, or if each hen is accustomed to spend a long time in the nest. Some hens which are never broody spend but a short time in the nest, and will not fight and break the eggs if another hen intrudes on them before they leave. Hens of this kind require fewer nests.

It is generally considered advisable that the nests should be arranged in a dark and secluded place, because hens are naturally inclined to hide their nests, and are more likely to deposit their eggs in such a place than in a more exposed

position. Darkness in the nests also tends to prevent egg eating, and any arrangement that will have this effect cannot be otherwise than desirable. A form of darkened nest box suitable for attaching to a wall at some height from the floor, or for laying on the floor, with the open side turned towards the wall, is shown in Fig. 2.

When arranging or constructing nests for the inside of a roosting house two things must be borne in mind ; namely, that floor space ought to be economized as much as possible, and that the nest boxes must not form comfortable roosting places for the fowls. The boxes should therefore be fixed to the wall so that the hens can use the floor beneath them for scratching. A convenient height would be between two and three feet. But it is still more important that the boxes should not constitute roosting places for the fowls, and if the boxes are made as shown in Fig. 3, the hens cannot rest in any part of them, except they lie in the nest itself or on the board which runs along the front. It may be noted, however, that this board has a sharp upper edge and does not make a comfortable resting place. Hens which have acquired the habit of lying in the nests at night can only be broken of it by removing them after dark to the regular roost.

Another useful feature of this simple nest is that it can be very easily kept clean. As the various parts are screwed together, the box may be taken to pieces when it is considered necessary to give it a thorough cleaning ; but this is seldom necessary, as there are slits near the bottom at back and front so that the box can be easily swept out. An important point in the construction of these boxes is that the dividing boards are sloping at such an angle that fowls cannot possibly perch on them. The nests can be boarded on top to make them darker and more secluded by running a board from end to end and fastening it to the ends and partitions.

To provide suitable nests to be attached to the outside of a portable house, the box may be constructed in almost the same manner as that shown in Fig. 2, but without the place for entrance at the ends, and it may be fixed to the end of the house in the manner shown in Fig. 4. This is certainly the most convenient style of nest for small portable houses, because

it is seldom that there is any space to be spared inside the house; but the hens always have access to the outside nests through the opening in the end of the house, against which the box rests, and the attendant can always remove the eggs from outside without entering the house or disturbing the fowls.

Feeding Troughs.—Troughs should be used whenever fowls are fed on mash, and even when dry foods only are given very many poultry keepers use some style of trough, box, or hopper. At one time it was customary not to bother with troughs even for feeding mash, and the practice prevailed of throwing down the mash in the yards and allowing the fowls to eat it or

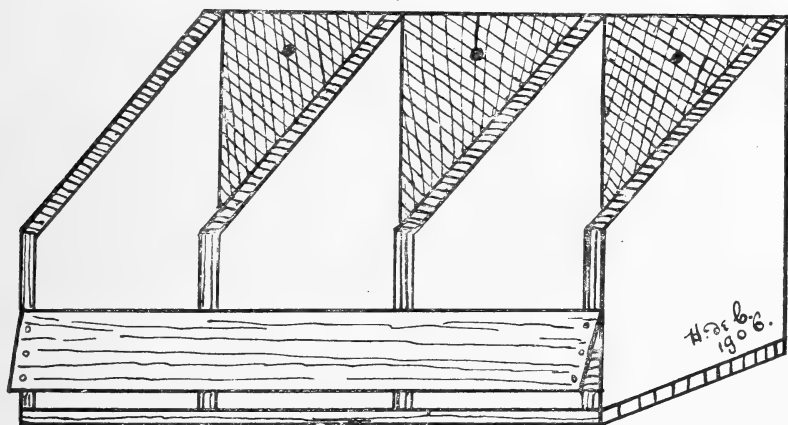


FIG. 3.—NEST BOXES, TO BE HUNG ON INSIDE WALL OF HOUSE.

trample it into the ground, but this practice is fortunately no longer continued except by the most careless of poultry keepers.

The evils of careless feeding, which is another name for throwing soft food about in all directions, are :—(1) The hens are liable to be overfed ; (2) considerable quantities of food are wasted by being thrown in dirty places and mixed with the filth of the yard or trampled into the earth ; (3) there is considerable danger of contracting such diseases as cholera, which arise from filthy conditions of feeding. Throwing food on the ground is often responsible for the spread of roup, diphtheria, gapes, and other complaints.

Cleanliness in feeding is essential to success, and it follows that the troughs must be of such a shape that they can quite

easily be kept clean. Many troughs have been devised with the object of keeping the fowls from standing on their food, and whilst the idea is an admirable one, it is far more important that the trough should be of so simple a kind that it can be cleared of food in a few moments, and that it can be thoroughly scoured as often as may be necessary without any great expenditure of time. Another desirable point in troughs is that they should be capable of being filled with food easily and quickly without spilling any of the food on the ground, and that it should be easy to return any food that the fowls may leave in the troughs to the mixing pail. It is only troughs of the plainest kind that fulfil these conditions, and it may be taken as an axiom that for all practical purposes the simpler the trough the more suitable it is for everyday use in feeding farm poultry. There are several materials from which useful troughs may be made, and these include wood, galvanized iron, zinc, tin, earthenware, stone, &c. The trough most generally used is made of wood. The V-shaped trough is perhaps most convenient, and for feeding hens it may be made in the following way:—Take a board one inch thick and nine inches wide, and about six feet long. Divide the board with a saw so that one piece is four inches wide and the other piece five inches. Then nail the wider part on the edge of the narrower so as to form a V. Next take two pieces of wood from which to make the stands. Let these be about twelve inches long and six inches wide, and one to two inches thick. Saw out of each a V-shaped gap to fit the trough, and having placed the trough in this fasten with nails. The pieces which are sawn out will make ends for the trough. These troughs are sometimes made with a board or lath extending from end to end along the middle with the object of keeping the hens from walking on the food, but this is hardly necessary, as hens seldom or never stand in a trough which is made of the size and in the style described. Another plain form of trough which can easily be kept clean is one having a flat bottom and strong upright sides. It is made by taking two boards nine inches wide and one inch thick and six feet long, and sawing one of them through the middle. The divided parts are then nailed to either edge of the unsawn board, and two pieces of

board are nailed across the ends. This trough will stand steadily on the ground without trestles.

Square wooden boxes may also be used, or pans made of any of the materials mentioned above, and, provided simplicity of design is adhered to, long or short troughs may be used with equally good results.

Fowls should be fed, so far as the weather permits, out of doors, and when exposed to the weather the troughs will keep sweeter than if placed under cover. But in the winter time

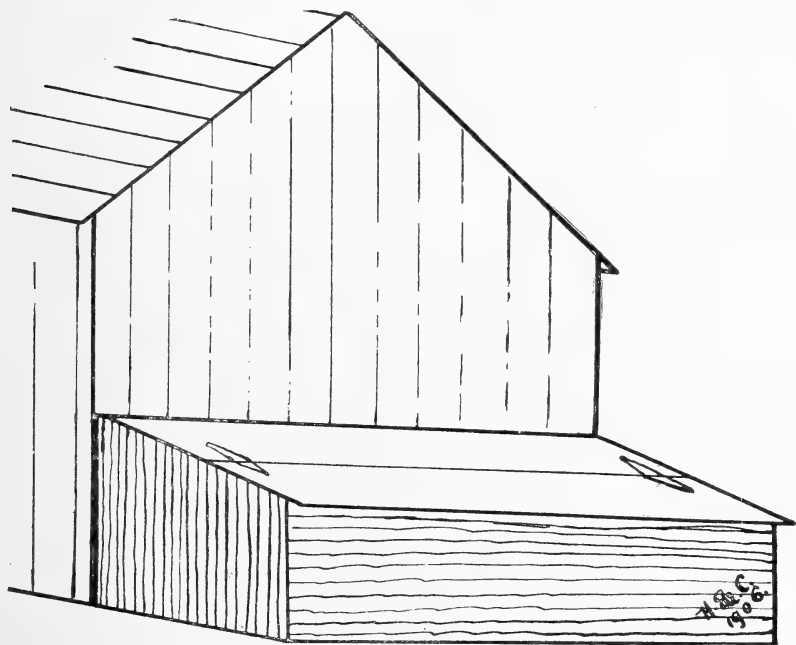


FIG. 4.—OUTDOOR NESTS ATTACHED TO PORTABLE HOUSE.

the feeding must be done largely in the shelter sheds, and in this case it is advisable that the troughs should be exposed to the weather between meals.

Feeding Grain from Hoppers.—Within the past few years a considerable change has taken place in the methods of feeding poultry on large farms, and both old and young fowls are now much more extensively fed on dry foods than they formerly were. The dry feeding system has been adopted with very great success by large feeders, and the feeding of fowls from hoppers certainly means a large saving in the labour bill of an

extensive farm. The foods fed from hoppers are whole corn, dry crushed corn, and dried meat scraps of various kinds.

Feeding without Troughs.—The only case in which feeding without troughs or hoppers can be recommended is when whole corn is being fed to hens, and there is a clean bare place or a field in which it can be scattered, or when it is mixed with the litter of the scratching shed with the object of inducing hens to take the exercise which they need, especially in winter. In all other instances suitable troughs must be used.

Water Troughs and Vessels.—The vessels which are used to hold drinking water in poultry yards may be broadly divided into two classes; namely, open troughs and closed vessels. The advantages of the closed fountain are that but little dirt or dust can get into the water, and consequently the water keeps cleaner than in an open fountain; fowls cannot walk into the water, chickens cannot be drowned, and fancy fowls cannot wet their combs, wattles, beards, and crests. The disadvantages are that it takes time to fill or empty it, and that it is much more difficult to keep clean than an open trough. Taking these things into consideration, the practical poultry keeper, who has some hundreds of fowls, generally decides that open troughs are most suitable.

The materials from which water troughs are made, and their size and shape, are matters of no great importance. But the important points are that the water should by regular renewal be kept fresh, that it should be kept cool by placing the vessels in shady places, and that the vessels should be kept clean. Wide, shallow vessels are undesirable, as hens walk into them too easily, and they collect an undue amount of dirt; and for this reason it is preferable that the trough should be narrow in proportion to its height and capacity, but not so narrow as to make it difficult for the fowls to drink from it or as to make it liable to be easily turned over.

An open V-shaped trough of the same kind as that already described for feeding fowls makes a most desirable vessel for holding water where hens are kept in flocks from fifty to one hundred, and where a large quantity of water is consumed daily. For rapidity in cleaning and refilling this style of trough is unsurpassed.

Closed drinking vessels are made in various styles, but most of them are self-feeding, and the principle in all is the same. There is usually a reservoir with a saucer-shaped receptacle for water beneath it, and so long as the reservoir contains water it feeds the saucer, so that as the fowls drink, fresh water runs automatically from the reservoir to the saucer.

Another matter for consideration in connection with the watering of poultry is the position which the troughs ought to occupy. They should not be placed either in the roosting house or in the scratching shed, and the most suitable place is in the yards or pens. Exposure to the heat of the sun spoils water for drinking, so that the troughs should be placed where the direct rays of the sun cannot reach them, and in such a position that the water cannot become frozen in winter.

Boxes for Grit, Shell, Lime, &c.—On the average poultry farm there is no occasion for keeping such things as grit and shells in separate boxes, and the best thing the poultry keeper can do is to throw an occasional load of gravel, old mortar, charcoal, and sea shells (if he can get them) in the yards. Fowls need these things, and often suffer very much for the want of them. They require grit to aid in digesting their food, and the sharper it is the better. They must have lime for shell making, and charcoal is believed to be most beneficial in keeping the birds in a healthy condition. All these things are inexpensive, and can be supplied in bulk.

Where receptacles for grit, shell, &c., are thought desirable, they may consist of boxes of any kind that can be obtained cheaply, and perhaps the best place to keep them is in the scratching shed, where they may be nailed to the wall.

It is unnecessary, on the average farm, to supply fowls with special dust baths in summer, because they much prefer dusting in some dry spot in the yards. In winter the hens usually dust their bodies in the litter of the scratching shed when this consists of dry earth, sand, cinders, &c., and nothing more is necessary for their well-being; but in case there is no scratching shed and the floors of the houses are of wood, it becomes necessary to provide a dust box.

This may consist of any large box filled with dry earth, sand, ashes, &c., placed under cover of a house or shed. The use of

dust baths is to keep the fowls' bodies clean and free from vermin, and the best material for this purpose is dry earth. In cases where vermin have already got a footing it may be advisable to mix some dry lime or sulphur with the earth, but earth alone is a good preventive. Ashes and road dust have been recommended, but they make the feathers brittle and dry, and also discolour the plumage.

H. DE COURCY.

In the growth of roots it is obvious that the point at which the farmer should aim is the production of bulbs with a high feeding value. Quality is not, however, easily estimated except by analysis, and for this reason the characteristics which have for many years been the object of improvement have been external ones, such as shape, colour, and size, rather than the chemical composition, which is the best or only indication of the feeding value. Attention has been drawn to this subject in some experiments with mangolds conducted at Cambridge University by Messrs. Wood and Berry,* in which it was concluded that the method most likely to result in improvement in the feeding value of mangolds is selection for high percentage of dry matter in the root.

**Experiments as
to the Quality
of Swedes.**

This point, which is one of great practical interest to farmers, is also dealt with in some experiments with swedes conducted by the Edinburgh and East of Scotland College of Agriculture in the three years 1902-1904. A large number of varieties were grown at different centres and compared as regards (1) cropping power or yield per acre, and (2) quality or quantity of food material as shown by chemical analysis. The results afforded ample proof that some varieties have a strong hereditary tendency to produce large crops, but they also showed that a deficiency in weight may be compensated for by an improvement in quality; while, on the other hand, a deficiency in

* *Journal*, September, 1905, p. 353.

quality as estimated by the dry matter was sometimes made up by the quantity of produce. For instance, a 20-ton crop analysing 13 per cent. of dry matter is equivalent to a 26-ton crop containing 10 per cent. of dry matter, on the assumption that all the dry matter is of equal feeding value. The 26-ton crop contains then an excess of 6 tons of water over that in the 20-ton crop, and the extra labour involved in the handling of a watery turnip crop is a point to be taken into account, as well as the injurious effects sometimes consequent upon injudicious feeding of watery bulbs. A proof of the fact that the dry matter in the roots can be taken as an indication of the feeding value was afforded by the Sheep Feeding Experiments of 1903 and 1904 conducted at the same College.

The sheep in these experiments were of the same class and nearly of the same size. They received the same concentrated foods and as much hay and swedes as they could eat. The swedes used in 1903 analysed just over 10 per cent. dry matter, while those of 1904 analysed just under 13 per cent. Of the former there were consumed 17·2 lb. per head per day, and of the latter only 12·4 lb. The theoretical quantity to give the same amount of feeding material should have been 13½ lb. The sheep did equally well, and this indicates a clear advantage in favour of the swede with a high percentage of solids. In fact, the sheep consumed 27¾ tons of the former for every 20 tons of the latter. Evidently, therefore, bulk can be sacrificed to a considerable extent without decreasing the feeding value of the crop if it is balanced by improved quality.

As regards actual yield, the experiments showed the Premier, in the two seasons in which it was tested, to be the heaviest cropper; while the Conqueror occupied a hardly less prominent position in being second in each of the three seasons; while the Magnum Bonum, Paragon, Dods' Favourite, Royal Crimson, Waverley, Model, Aberdeenshire Prize, Queen, and Best of All, may be regarded as varieties giving heavy crops. Stirling Castle, Kinaldie, and New Arctic are more prominent for quality. Carter's Elephant, Excelsior, and the rest of those tested proved themselves light croppers.

In the following table the yield per acre, the weight of dry matter per acre, and the percentage of dry matter are given, the

figures in each case representing the average of two or three seasons :—

Variety.	Yield per acre.			Dry matter per acre.			Percentage of dry matter.
	Tons.	cwt.	lb.	Tons.	cwt.	lb.	
Magnum Bonum	26	1	6	3	0	78	11'45
Queen	25	2	38	3	0	24	11'50
Premier	27	14	1	2	18	95	10'51
Paragon	25	16	54	2	18	73	11'44
Stirling Castle	24	3	47	2	18	69	11'83
Aberdeenshire Prize	25	6	6	2	18	63	11'47
Dods' Favourite	25	15	51	2	18	58	11'18
Conqueror	26	2	73	2	18	49	11'05
Royal Crimson	25	12	79	2	18	38	11'38
Best of All	24	17	28	2	17	83	11'58
Kinaldie	24	4	49	2	17	52	11'98
Waverley	25	11	43	2	17	1	10'86
Model	25	6	80	2	16	19	10'87
New Arctic	24	5	88	2	16	8	11'69
Excelsior	23	19	1	2	15	111	11'47
Holborn Elephant	24	1	87	2	13	70	10'96
Champion	22	14	88	2	12	86	11'01
Giant King	23	4	39	2	12	39	10'71
Dods' Bronze Top	23	5	66	2	11	58	—
Kangaroo	22	15	66	2	11	16	11'08
Monarch	23	11	52	2	10	21	10'13

The varieties are arranged here according to the total weight of dry matter, and it is interesting to notice how in some cases a deficiency in the average percentage of dry matter in the root is compensated for by a high average yield; for instance, Premier, which gave the highest yield, but had nearly the lowest percentage of dry matter, stands third in total dry matter. Kinaldie, on the other hand, which easily takes the first place for absolute quality, is, owing to a comparatively low yield, reduced to the eleventh place as regards total dry matter.

As is well known, the turnip crop depends largely on the character of the season, and seasonal influence on the quantity or bulk of the crop is often only too evident. It seems, however, from these experiments that the quality of the root may be even more adversely affected by unfavourable weather than the quantity, and that the difference in the feeding value of a crop in a good compared with a bad year may be very much greater than is indicated by the additional yield alone.

One point which has been abundantly proved by these experiments is that the medium-sized root is almost invariably

of better quality than the large one, even of the same variety, and this is in agreement with the investigations at Cambridge above-mentioned, where it was found that there was a tendency for the weight of the root to fall as the dry matter rose. There is, therefore, on the whole, more food-material in a small turnip than in an equal weight of a large one, and it would seem that quality rapidly deteriorates with size, and manures of a forcing nature act prejudicially to quality. Greater variations in the quality of any one variety were often found than in that of different varieties. The chief cause of this, as far as could be observed, was the varying weights of crops, or rather size of roots. While the average weight of the bulbs was under 4 lb., on several farms it was very much over this. Quite a number of bulbs of the larger-growing varieties were more than 12 lb. in weight. On Greenburn six bulbs were found to scale without the shaws just over 18 lb. each. In fact, all the varieties produced a somewhat exceptional growth on this farm. The analysis showed a corresponding drop in the quality.

The Sheep-Feeding Experiments previously referred to indicate that the object should be to grow as large a weight of feeding material as possible, and the present experiments go to prove that this depends more on quality than on quantity. Since a higher percentage of feeding material is found in the medium-sized root, the aim should be to raise the medium size in preference to the over-swollen but popular bulb.

Another of the College's experiments has shown that this can be attained by limiting the plant's growing area, which can be accomplished in three ways: the usual width of drill may be reduced, or a narrower hoe may be employed, or the two methods may be combined. Objection may be taken to this on the ground of its reducing the crop, but the experience of those accustomed to weigh this crop disproves this. The appeal to the weighbridge has shown that the heaviest weights are produced by a narrow drill. Some use 26-inch drills, while others sow as closely as 24 inches, while at the same time many employ a 6½-inch hoe, which is considerably smaller than the one commonly used. The effect of this on the number of roots raised per acre is very striking. If two acres of 27-inch wide drills are taken, and one of these acres is hoed with an

8-inch hoe and the other with a $6\frac{1}{2}$ -inch hoe, the difference in the number of plants on these two acres would be 6,700; while on an acre with drills 24 inches apart and hoed with the $6\frac{1}{2}$ -inch hoe, the plants would exceed in number those on the first acre by over 11,000. Large roots mean large feeding areas and few plants, with correspondingly watery contents. Since equal and even greater weights can be raised from medium bulbs, it is evident that a much larger weight of feeding material can be obtained from them. The best results, too, derived from limiting the growing area, will probably be obtained from varieties with a strong hereditary tendency to grow large, such as the Premier, Conqueror, Magnum Bonum, and those proved by the tests to be heavy croppers. Some varieties—as, for example, Aberdeenshire Prize—have a marked tendency to produce a large mass of shaws; while others—as, for example, Sutton's Queen—are characterized by their small leafage. In fact, this is a special peculiarity of the Queen, and makes this variety eminently suitable for the above treatment, the more especially as the luxuriance of the shaws bears no relation to the weight of the feeding material of the crop. A small leafage would go far to counteract the possible occurrence of mildew.

In this connection some experiments conducted by the University College, Reading, may be mentioned. Plots on twenty-four farms in Berks, Bucks, Dorset, and Oxon were selected, each representing twelve drills 30 yards long. The drills were not of the same width, varying from 17 to 27 inches, the majority being about 20 inches apart. It was intended to have the plants left at distances of 6, 11, 16, and 21 inches apart in the rows respectively, but very great difficulty was experienced in leaving the plants at these distances exactly, and at the end of the trials they were found to average $8\frac{1}{2}$, 11, 16, and 18 inches respectively.

More than 75,000 roots were counted and weighed, and the average weights at the different distances are given on the next page.

The narrowest drilling was found to give the greatest yield per acre. If swedes are reckoned as worth 10s. a ton, a crop of roots grown $8\frac{1}{2}$ inches apart in the rows is worth about £1 per

Distance apart.				Number of roots weighed.	Average weight of one root.	Average yield per acre calculated from the actual yield of the plots.
8½ inches 				27,376	Lb. 1'12	Tons. 18'2
11 " 				20,178	1'51	17'8
16 " 				15,419	1'92	17'4
18 " 				12,860	2'21	16'1

acre more than a crop in which the rows are 18 inches apart, without taking into consideration the greater dry weight and increased feeding value of the smaller roots; and, so far as weight of crop and probable quality are concerned, a distance of 8½ to 10 inches in the rows is considered to be better than larger distances apart. Professor Percival, in reporting on the experiment, observes:—"Whether this increase in value per acre of closely-planted roots compensates for the greater cost of hoeing, the reduced cleanliness of the land which close drilling involves, and the trouble and cost of cleaning and handling the larger number of roots, are matters which must be considered before any recommendations can be made. Where the crop is fed off by sheep the latter point is of no moment."

Five typical roots from each plot on the twenty-four farms were selected and the dry matter in them determined:—

						Average percentage of dry matter.
Roots 8½ inches apart	...	...	...	...	...	11'15
" 11 " "	...	...	...	...	...	10'88
" 16 " "	...	...	...	...	...	10'84
" 18 " "	...	...	...	...	...	10'78

In one or two cases the dry matter was as high as 12'9 and as low as 9'85, an extreme difference of about 3 per cent. The majority, however, were much nearer to the averages given above. The average difference observed in these experiments between the widest and narrowest planting was '37, or less than ½ per cent. This small amount means, however, a difference of 1½ cwt. of dry matter on a crop of 20 tons of roots, and this may be looked upon as a minimum figure. It might easily be much more, as some of the closely-planted roots had as much as 3 per cent. more dry matter in them than those wide apart in the rows.

Experiments as to the composition of turnips and the best method of determining their feeding value are also being undertaken by the Aberdeen and North of Scotland College of Agriculture, very much on the lines of the Cambridge Experiments undertaken by Messrs. Wood and Berry. An analysis has been made of 96 yellow turnips (Greentop Yellows) taken from the same drill, with the following result :—

Number of turnips analyzed.	Average percentage of dry matter.	Average weight.
		Oz.
10	14.4	16
10	11.7	21.4
10	11.3	26.25
10	11.0	32.7
9	10.8	28.7
10	10.5	30.75
10	10.3	27.1
10	9.8	38.1
10	9.4	29.3
7	8.8	37.7

The bulbs were arranged according to the percentage of dry matter which they contained. It will be seen that the average weight of the first five lots is less than that of the second five, but in this connection Messrs. Hendrick and Greig observe that there is no certain connection between the size of the turnip and the percentage of dry matter. In a very general way the small turnips have the high dry matter, while large ones have low dry matter, but a small turnip may have low dry matter and a large one may have high dry matter.

The average weight of all the turnips was $28\frac{2}{3}$ oz. and the average dry matter 10.84 per cent.

As the object of these experiments is the determination of a method by which seed-mothers may be selected possessing the best characteristics of the turnip with a view to the production of an improved variety, it is important not only to select bulbs with a good percentage of dry matter, but also with dry matter of good quality; and after a number of trials, the conclusion has been come to that a guide to the quality of the dry matter is found in the amount of solid matter contained in the sap, and the ratio which this bears to the total solids. Experiments on this basis are being continued.

There are three recognized methods of treating seed-grain for the prevention of bunt and smut,* viz., sprinkling with a solution of bluestone or copper sulphate, or with a solution of formalin, or by the hot-water system of Jensen.

**Prevention
of Smut.**

Another method is mentioned in a Farmers' Bulletin (No. 250), issued by the United States Department of Agriculture, which is called the "Sar Treatment." The solution employed is stated to be easily prepared, cheap, capable of being kept for any length of time, and if properly applied to be completely effective. It is made by thoroughly mixing 15 lb. of flowers of sulphur with $\frac{1}{2}$ lb. of powdered resin, to which is added, little by little, about $6\frac{1}{2}$ quarts of water till the whole is in the form of a thick paste; 10 lb. of dry powdered (98 per cent.) caustic soda (concentrated lye) should then be stirred in vigorously while the whole mass turns reddish brown and boils violently. Enough hot water is added to bring the solution up to 6 gallons. This stock solution should be kept in tightly-corked bottles and should be well shaken before being used.

The seed-wheat is treated with Sar solution as follows:— Either 1 quart of the solution is diluted with 50 gallons of water and the grain soaked therein for about twelve hours, or else a strong solution (1 gallon of the stock to 50 gallons of water) is used and the grain soaked for only two hours. In either case the grain must be stirred several times during the treatment, and spread out to dry afterwards. If the grain contains much smut, it should first be washed with water, in order to skim off the smut balls before it is put in the Sar solution to soak.

In making the solution it is important that too much water should not be added to the resin and sulphur, but only just enough to make a stiff paste. This paste should be made in a barrel or large keg holding at least six times the bulk of the paste, as when the caustic soda is added it boils violently for a minute or two, and will run over the sides of the vessel unless it is of ample size. Before making the paste, 6 gallons of water should be measured into the barrel and the level of the water accurately marked, so that when the material is mixed the exact quantity of water may be added.

* See Leaflet No. 92.

The wheat should be put into barrels or, preferably, a large tank having a bunghole at the bottom protected on the inside with wire gauze, so that the liquid can be drawn off. The barrel or tank can then be filled with water in the first instance. After this has been drained off, the diluted solution should be poured over the wheat until it is covered several inches deep, and should then be stirred to ensure all the grains being wetted. The stronger mixture mentioned above may be used several times, but it should not be employed the second day, as it rapidly loses its strength.

United States.—According to the preliminary returns received by the United States Department of Agriculture up to July 1st, 1906, the acreage of maize is about 95,535,000 acres, an increase of about 1,524,000 acres or 1·6 per cent. as compared with estimate of the acreage planted last year. The average condition of the growing crop on July 1st was 87·5 as compared with 87·3 at the same date last year. The average condition of winter and spring wheat combined was 87·8 as compared with 85·8 on July 1st, 1905. The average condition of the oat crop was 84 as compared with 86 last month, and of the barley crop 92·5 against 93·5.

**Notes as to
Foreign Crop
Prospects.**

France.—The French Ministry of Agriculture reports that according to returns up to 15th June, 1906, 3,644,000 acres were under potatoes. The condition of the crops on 1,872,400 acres was reported to be good, on 1,533,800 acres fairly good, on 220,000 acres passable, and on 18,100 acres the condition was said to be indifferent.

Germany.—According to the Report of the Ministry of Agriculture up to July 15th, the condition of the winter and spring grain was generally good. The frequent heavy showers, however, had not been altogether favourable to the growth of potatoes, and the early sorts were somewhat diseased, but generally the condition had improved since the June Report.

Russia.—The official *Commercial and Industrial Gazette* of St. Petersburg of July 8th publishes a detailed report on the crop prospects of European Russia up to July 5th. According to a summary furnished through the Foreign Office, the winter grains promise an average yield, while the spring grains threaten

to be below the average. The Volga Governments, which suffered badly last year, are threatened with heavy crop failures this year too. In the Central Volga region, the basin of the Don and the Don Territory, in the North-Eastern and in the Ural the condition of all the cereal crops appears unsatisfactory and in places bad. The Consul-General for Poland, however, reported on July 13th that the harvest in that country promises this year to be one of the best on record, and a yield considerably above the average is expected.

Hungary.—According to the reports published by the Ministry of Agriculture up to 15th July, 1906, the yield of the crops is expected to come up to the estimate in point of quantity, but the quality may leave something to be desired. By an oversight in the last number of this *Journal*, the figures of the estimated yield were given as metric tons of 2,204 lb. instead of metric centners of 220·4 lb. In the table below they have been converted into English weights :—

—					Estimated Yield for 1906.	Yield for 1905.
					Cwt.	Cwt.
Wheat	...	...	...	...	91,473,281	84,357,769
Rye	...	...	...	...	25,898,180	27,036,637
Barley	...	...	...	...	26,286,045	26,757,819
Oats	...	...	...	...	23,199,461	22,282,003

The attention of the Board was recently directed to a disease among sheep in Ayrshire, and one of the Board's superintending veterinary inspectors was directed to make some inquiries into the matter.

A Disease of Sheep in Ayrshire.

The disease is usually observed towards the latter end of May, in June, and the early part of July, among ewes with lamb at side; it attacks ewes of all ages, but chiefly the older ones, though it has been seen among hogg ewes, and occasionally in shearling tups. It is said usually to attack ewes in good condition and those doing their lambs well. Tups are but rarely affected, probably in consequence of the artificial feeding they receive. It has not been seen in lambs, but all the lambs, except a percentage of ewe lambs for stock, are sold during the month of August; no

wethers are kept. The breed kept is the blackfaced or mountain sheep.

It is seen both in sheep on the hills and on the improved pastures in the low lands. The disease is considered to be more prevalent after a mild wet winter or spring, followed by dry weather. Some farmers consider that the disease is more prevalent on limestone land or land which has been dressed with lime. The attention of the shepherd is usually drawn to the affected sheep when driving the flock towards the top of the hill at night ; some sheep are found dead, or die suddenly when handled. Certain sheep may be seen to lag behind or to move slowly, and if hurried by the dogs they often fall down exhausted. An affected sheep never wanders far, and as the disease progresses the animal will remain standing in one position ; it is disinclined to eat, only feeding for a few minutes at irregular intervals, becomes very dull, sleepy of the eye, with the head hung down, the ears drooping ; it takes no notice of the lamb, and there is a loss of milk ; rumination is partially or entirely suspended ; the fleece becomes dry, matted, and generally disarranged ; progressive weakness follows, marked by unsteady gait, inability to stand, coma, and death. Some sheep have been observed to scour, and "poking of the dewlap" or œdematous swelling of the sub-maxillary space is often present. The visible mucous membranes, particularly the conjunctivæ, become very blanched. A "sound of water" inside the abdomen is detected in some cases when the affected sheep are turned on to their backs, during which process the sheep may collapse and die. The only conditions noted after death by some of the shepherds have been water in the abdomen, around the lungs or the heart.

The treatment usually adopted is, if possible, to get the affected sheep on to better pastures (usually on to the low lands around the farm buildings) ; many die while being taken in. The lamb is naturally removed, and seeks its own living. No medicinal or other treatment appears to have been tried. The affected sheep, if noticed in time, are not clipped. Some sheep seem to rally quickly, and even take the lamb again after being brought on to better pasture ; other sheep, and the majority of those which survive, do not thrive, although becoming apparently stronger ; they usually become re-affected, or relapse into their

former condition the following year after lambing. During the second season's attack death is still more probable; but should the affected animal survive (not recover), it is drafted out of the flock and sold. The lambs are said to remain unaffected, although naturally smaller in growth than the rest through a too early loss of the ewe's milk. Losses are estimated on affected farms from about 3 per cent. to 10 per cent.

The disease appears to be that of parasitic gastritis. One animal, stated to be a typical case and to have become affected the second time, was examined before being killed. The animal was extremely weak, showed two clippings of wool, mucous membranes blanched, temperature 103.5; abdomen dropsical, respirations irregular and accelerated; the animal fell down in a state of collapse on being handled for examination. The *post-mortem* examination proved that the cause of this sheep's illness was parasitic gastritis, and it may be presumed that the same cause gives rise to a varying annual loss of sheep in this district, but further *post-mortem* examinations and investigations would be necessary before arriving at a definite conclusion, as possibly other causes may be at work.

The presence of sick animals on the pastures from year to year tends to spread the disease, and precautions should be taken to move affected animals into a special field or fold on the first indication of symptoms of attack. A piece of land should be fenced for this purpose, and dressed with salt at the rate of $\frac{3}{4}$ ton to the acre annually.

It may also be useful to treat the affected sheep with small doses of sulphate of iron, salt, and gentian, administered in a little dry food. One ounce of iron, 1 oz. of salt, and 2 oz. of gentian would be sufficient for twenty sheep.

At the Sixth International Conference of Sheep Breeders, held at Derby on June 26th last, Mr. S. B. Hollings read a paper on

**Preparation
of Wool
for Market.**

"The Preparation of Wool for Market," from which some extracts may be given. In commencing Mr. Hollings drew attention to the increased values now obtaining for

wool, and said that there was on every hand an incentive for all sheep breeders to look at their growing fleeces with feelings of

pride, while manufacturers could urge with some degree of reason the necessity of preparing wool for market in a real, practical, and up-to-date manner. A high tribute is paid to the manner in which the Colonial clip is placed upon the market, it being stated that more objectionable and foreign matter might be found in 250 fleeces taken from an average English sheep farmer than would be taken out of 1,000 to 2,000 fleeces of Australian or New Zealand origin; and while in view of the much smaller size of the flocks at home it would not pay British wool-growers to divide their wool into the numerous classes which usually constitute an Australian clip of wool, buyers want a better system than that at present in vogue under which English sheep farmers as a rule roll into the fleece all the bellies, britch, and shearlings which adhere to the fleece. This cannot be called wool, it being simply so much foreign matter which the sheep has picked up during its existence; all this has to be removed in some way or another, either by the sheep farmer himself or the buyer, for, as Mr. Hollings says, "earth, dung, straw, and vegetable matter never made tops, yarns, or pieces, and never will."

In regard to Colonial methods of preparation Mr. Hollings observes:—

"Briefly put, every Colonial station of even average dimensions places at the head of the clip a competent classer, whose business it is to see that every fleece is properly classed as to quality, then skirted and locked before being put into the bale to be packed for market. Every shorn fleece is handled with intelligence, careful attention being paid to those points which a grower knows will tell in his favour when the wool is offered for sale. A good attempt is usually made to keep all the qualities separate, "mixed" parcels only being taken by those who like to buy such a clip of wool at more or less a speculative price. *Uniformity of quality* is a very valuable feature in any parcel of wool, and buyers know how to appreciate this when they see a clip straight and uniform in regard to quality and breed of wool. It is a great mistake to bale together fine and coarse fleeces, and even when handling fleeces of the mutton breed it pays to bale separately the fine, medium, and coarse fleeces.

"It must be remembered that before these leave the sorting

table, every fleece, without exception, is taken and skirted—that is, the heavy bellies and britch are removed, the remaining fleece then being taken and rolled up separately. The great thing to remember is that anything of an objectionable nature is seldom rolled into the fleece, the bellies, stained pieces or britch, and the locks being baled separately, and then each lot is sold on its merits. By this method of marketing wool, buyers approach Colonial clips with confidence, men being satisfied that the middle of the bale will be as free of foreign matter as are the fleeces on the outside edge. A vast improvement has of late years been noted in connection with the wools from the River Plate, though even here there is hardly that uniformity in classing and preparation for market which one observes, say, in New Zealand fleeces of a corresponding quality. I now leave out Australian wools, because the great bulk is merino—English, New Zealand, and River Plate wools all coming under the category of crossbreds. During the past ten years—thanks to the introduction of the best English blood, and the adoption more or less of Colonial methods—River Plate wools have vastly improved, both in quality, character, and general get up. Still there is room for improvement, and particularly the system of selling all the qualities together, which so frequently is the case. When fine and coarse qualities of crossbreds are sold together, the buyer, as a rule, tries to secure the parcel at the value of the coarser quality, consequently the grower makes a sacrifice which he need not do if he will, before baling, separate the fleeces into their respective qualities, say, fine, medium, and coarse. A New Zealand clip, as a rule, is done in this fashion, hence we see the big prices being paid to-day for New Zealand grown wools. It does indeed show to what perfection crossbred wools are being grown in New Zealand, when greasy half-bred is selling from 15d. to 17d. per lb., this being the reward for general excellence on the lines just named. It is hardly to be expected that English sheep farmers will go to the trouble of classing like we see in New Zealand, but as regards keeping out extraneous matter it must be done, otherwise that clip will inevitably suffer in regard to price per pound.”

Mr. Hollings then goes on to refer to the evils of false packing,

and observes that there cannot be any possible excuse for any sheep farmer to roll into his fleeces heavy bellies and britch without the draggings or "muck lumps" being removed. This has to be clipped off, while even if the wool comes to be scoured all this extraneous matter will go down the drain. It must ever be borne in mind that every wool buyer acts upon the adage "once bitten, twice shy." If a buyer purchases a clip of wool and the same turns out to have been badly handled, that farmer's next clip will be ear-marked, and the buyer will make a serious attempt to get back out of the farmer the loss he encountered in the previous year. Nothing shakes a buyer's confidence so much in any clip as to be deceived in the "clean yield" which he estimates the wool will give, and "lost confidence" is a serious matter for any clip of wool no matter where grown.

Mr. Hollings recommends that the shearing should be done on a clean-swept floor, and not under any circumstances on a bed of straw. A clean floor will prevent vegetable matter from becoming entangled with the wool, and the whole fleece should be carefully gathered up before the shearer commences to shear the next sheep. Wool containing loose hemp, string, straw, short fluffy bits from the inside of tares, means much extra cost in manipulation, while owing to vegetable matter not taking the dye like wool, serious loss is caused through spoiled pieces. In English wools the worst feature is straw. After washing, sheep should never be turned into straw before shearing, while even in the turnip field straw should not be spread unless the land is very heavy and wet. The worst feature of all, namely, the tying up of fleeces with loose, fluffy jute twine, has nearly disappeared, though the practice is still continued in Somerset and Devon.*

While growers persist in rolling into their fleeces everything that has been picked up while the wool is growing, no surprise need be felt at the "gingerly" way in which such wools sell. In a quiet time and when prices are low a buyer favours most that man's wool which he knows by past experience has been properly skirted and locked, while if he handles a doubtful clip he allows a sufficient margin to compensate him for any unex-

* See Leaflet 82, on the "Preparation of Wool for Market."

pected eventualities. The reasons why all objectionable matter should be removed are first, because it is a dishonest practice to bale it with the straight, full-grown fleece ; secondly, because it encourages suspicion ; and thirdly, because vegetable matter is not wool.

The following circular, dated July 11th, 1906, has been addressed by the Local Government Board to local authorities under the Sale of Food and Drugs Acts :—

**Preservatives
in Milk.**

SIR,—I am directed by the Local Government Board to request the attention of the Council to the subject of the addition of preservatives to milk.

A serious objection to the use of preservatives in milk has been pointed out in the report of the Departmental Committee on Preservatives and Colouring Matters in Food, who state that preservatives in milk “may be relied on to protect those engaged” in the milk traffic “against the immediate results of neglect of scrupulous cleanliness. Under the influence of these preservatives, milk may be exposed without sensible injury to conditions which otherwise would render it unsaleable. It may remain sweet to taste and smell and yet have incorporated disease germs of various kinds, whereof the activity may be suspended for a time by the action of the preservative, but may be resumed before the milk is digested.”

This Committee, after hearing evidence from milk traders, concluded that the addition of a preservative to milk is not necessary for the purposes of the milk trade, even in hot weather or where the supply of so large a place as London is concerned, and the Committee recommended that no preservatives should be added to milk.

In making this recommendation the Committee had special regard to evidence received as to two classes of preservative substances which, under various names, are frequently used as preservatives in milk, viz. (1) formalin (a 40 per cent. solution of formic aldehyde) and other preparations of formic aldehyde ; and (2) boron preservatives (boric acid, borax, or mixtures of boric acid and borax). The Committee considered that the addition to milk of formalin or preparations of formalin, even when the amount which could be detected was minute, was

objectionable, on account of the alterations effected by formalin in the character of certain of the constituents of milk and of its ability to interfere directly with digestive processes.

Although in the view of the Committee boron preservatives might reasonably be employed in the case of certain foods, within defined limits and subject to a declaration as to their presence and amount, the Committee recommended their exclusion from milk altogether; partly for the reasons above indicated, and partly also in consideration of the immense importance of pure milk for the nutrition of infants, invalids, and convalescents, and of the comparatively large quantity of milk which may be taken, particularly by children, in comparison with the other foods in question. Moreover the Committee had evidence "pointing to an injurious effect of boracised milk upon the health of very young children."

Since the report of the Committee was made the Board have from time to time had before them further evidence on the subject, and this supports the conclusions of the Committee not only as to the objections to the use of preservatives on the ground of public health, but also as to the ability of milk traders to conduct their business without use of preservatives. Thus in certain boroughs in London and elsewhere in which milk samples are systematically tested for preservatives, the presence of preservatives in milk, at any time of the year, has been found to be exceptional; and there is evidence to show that a very large number of milk vendors conduct their business without the use of these substances, even where the milk comes long distances by rail.

In some districts action under the Sale of Food and Drugs Acts has been frequently and successfully taken in order to bring about the disuse of preservatives in milk. Proceedings instituted against vendors of milk containing preservatives have usually been taken under Section 6 of the Sale of Food and Drugs Act, 1875. Conviction has followed, it being held that when the purchaser who asks for milk is supplied with milk plus a preservative he does not receive an article of the nature substance and quality demanded, and is prejudiced thereby.

The Board are of opinion that action under the Sale of Food and Drugs Acts in regard to preservatives in milk is desirable,

and that this subject deserves attention from all authorities in England and Wales charged with the execution of these Acts.

In this connection the following suggestions are made for adoption by the Council where a similar procedure is not already followed :—

1. *Information from Public Analysts.*—The Board suggest that public analysts should be requested—

(a) to record in their quarterly reports how many milk samples have been examined during the quarter with a view to ascertaining the presence of substances commonly in use as preservatives, and with what result ; and to draw the attention of the Council to instances where the use of preservatives in milk other than boron preservatives and formalin have come under notice ;

(b) to report, on completion of analysis, the facts as to samples of milk which have been found to contain any added preservative.

2. *Administrative Action where Preservatives in Milk are Reported.*—The Board would suggest that the Council should notify to milk traders, by circular or otherwise, that action will be taken under the Sale of Food and Drugs Acts in instances where preservatives are reported in milk.

Subject to this being done, and to exceptional cases of the kind referred to under the heading numbered 3 below, the Board consider that when the presence of any added preservative is reported in a sample of milk taken in accordance with the provisions of the Sale of Food and Drugs Acts, the case should in ordinary circumstances be regarded as one for the institution of proceedings under those Acts.

3. *Declaration and Notices.*—The Board think it desirable to draw attention to cases in which the vendor of the milk, with the object of escaping liability under Section 6 of the Sale of Food and Drugs Act, 1875, declares to the purchaser by means of a notice, label, or otherwise that he does not sell “milk” as such, or that its quality in regard to preservatives or other constituents is not guaranteed, or that it contains some added preservative.

The Board would suggest the desirability of frequent sampling in cases where “milk” is sold subject to declarations of the kind, with a view to ascertaining the condition of such milk in regard to preservatives.

The nature of the declaration made should in all cases be carefully recorded by the officer taking the sample, and should also be reported to the analyst when the sample is transmitted for analysis.

Where preservatives are reported in milk thus sold, the question will arise whether, in view of the nature and quantity of the preservatives added, it can be considered that the article has been rendered injurious to health, or that the purchaser has been prejudiced, to an extent which would justify the institution of proceedings under Section 3 or Section 6 of the Sale of Food and Drugs Act, 1875, notwithstanding the declaration made at the time of purchase.

This question is not without difficulty in view of the general objection to the employment of any preservatives in milk referred to above.

As regards formalin and boron preservatives, however, the Board are advised that the presence in milk of formalin to an amount which is ascertained by examination *within three days of collecting the sample* to exceed 1 part in 40,000 (1 part in 100,000 of formic aldehyde) raises a strong presumption that the article has been rendered injurious to health, and that the purchaser has been prejudiced, in the above sense; and also that similar presumption is raised where boron preservatives are present in milk to an amount exceeding 57 parts of boric acid per 100,000, or 40 grains of boric acid per gallon.

It appears desirable that the addition of preservatives to skim milk, separated milk, and condensed milk, should be watched and controlled on similar lines.—I am, &c.,

S. B. PROVIS, Secretary.

The Select Committee of the House of Commons appointed on the 5th March, 1906, to consider whether any, and if so what,

**Report of the
Select Committee
on the Butter
Trade.**

further legislation is required in order to secure the better conduct and control of the trade in butter and butter substitutes, have now presented their Report (H.C. 245. Price 4d.), in which after discussing the evidence which has been placed before them, they make the following recommendations:—

1. That Inspectors of the Board of Agriculture and Fisheries and the Department of Agriculture and Technical Instruction for Ireland, should have power to enter any premises where they have reasonable grounds for believing that butter is made, blended, re-worked, treated by any process, adulterated, or stored.

2. That premises where butter is blended, or re-worked, or treated by any process, or where abnormal butter is habitually produced, shall be registered with the local authority of the district as a butter factory.

3. That no fat, other than butter fat, and no vegetable or other oils, nor any substance capable of being used as an adulterant of butter should be brought into or stored or allowed to be in any registered butter factory.

4. That no substance be added to butter whereby the percentage of moisture in the butter is increased.

5. That the addition to butter at any stage of the process of manufacture of any fat not derived from milk be expressly and directly prohibited.

6. That margarine, when sold by retail, should be handed to the purchaser in a wrapper on which the word "Margarine" shall be printed in black solid capital letters, not less than half an inch square, and if more than one wrapper is applied to the margarine, the word "Margarine" shall be printed as above on the inner wrapper; that no fancy name or description should be permitted which refers to butter or anything connected with the dairy industry; that the outside wrapper, as well as the inside wrapper, should contain nothing but the word "Margarine" in type as aforesaid; and if any fancy name is printed on any other wrapper the word "Margarine" should be suffixed or affixed to the fancy name in letters of the same size, colour, and type as those in which the fancy name is printed.

7. That no margarine made in any margarine factory shall, when the process of manufacture is complete, contain more than 16 per cent. of water, and no margarine shall be imported containing more than 16 per cent. of moisture.

8. That premises where margarine is re-worked or submitted to any process shall be registered as margarine factories.

9. That Sub-section 3 of Section 20 of the Sale of Food and

Drugs Act, 1899, be amended so as to provide that a warranty or invoice given by a person resident outside the United Kingdom shall not be available as a defence to any proceedings under the Sale of Food and Drugs Acts.

10. That penalties for the importation of adulterated butter should be proportionate to the magnitude of the consignment.

11. That all practicable steps should be taken to bring about international agreements as to the prevention of adulteration.

12. That Section 4 of the Sale of Food and Drugs Act, 1899, should be amended so as to give the Board of Agriculture and Fisheries and the Department of Agriculture and Technical Instruction for Ireland power to fix standards for curd, and to give the Local Government Board power to fix standards for preservatives.

13. That the Department of Agriculture and Technical Instruction for Ireland should have power to take proceedings under the Merchandise Marks Act.

14. That nothing shall be sold under the name of butter which contains more than 16 per cent. of moisture.

15. That substances other than butter (not being margarine) containing butter fat should be sold, with a limit of 24 per cent. of moisture, under a name approved by the Board of Agriculture and Fisheries; provided that such name should not be calculated to prejudice the sale of the article.

16. That such substances when sold by retail should be delivered to the purchaser in a wrapper, approved by the Board of Agriculture and Fisheries, containing a description of the nature, substance and quality of the article; and as far as possible under the same conditions as apply to the sale of margarine.

17. That the provisions of the Margarine Act of 1887, as amended by the Sale of Food and Drugs Act, 1899, should apply to all such substances.

18. Inspectors acting under the special direction of the local authority should have power to enter butter factories, to inspect any process, and to take samples.

19. That butter having been treated by any process shall not be allowed to be replaced in the original packages.

Moisture in Butter.—With regard to the question of the amount of moisture which should be allowed in butter, the

Committee state that they had no evidence before them which would indicate that the existing law, which provides that butter containing more than 16 per cent. of moisture shall be presumed, until the contrary is proved, to be adulterated, is insufficient to prevent fraud or negligence with regard to the percentage of moisture in the manufacture by farmers and others of natural butter. So far as this butter is concerned the Committee see no reason for suggesting any amendment of the existing law as to moisture.

In this connection frequent reference was made by witnesses to the manufacture of salt firkin butter by Irish farmers in hill-side farms. This butter is a special article made with brine. The object of adding brine is to preserve the butter and to give it a flavour which is appreciated by consumers in certain districts. Numerous witnesses expressed the opinion that no special exemption as to salt firkin butter manufactured by Irish farmers is desirable, and the Committee concur in this view. They think that the existing law should be sufficient to prevent the manufacture by farmers of Ireland of salt firkin butter containing an unreasonable or fraudulent amount of moisture, and, so far as this kind of butter is concerned, they do not recommend any further legislation.

Colouring Matter in Butter.—Some objections were made to the use of colouring matter in butter. Some colouring matter is harmful, and the consumer cannot in practice obtain any security that the colouring matter used in any particular butter is innocuous. Other colouring matters, though not harmful, are objectionable in respect of the processes by which they are manufactured. One witness advocated the prohibition of colouring matter in butter as a step to the prohibition of colouring matter in margarine, but it was pointed out that a general prohibition of the use of colouring matter would not necessarily enable purchasers to distinguish between margarine and butter. Several witnesses objected to any interference with the present practice, both from the trade point of view and in the interest of the consumer, and the Committee do not think it necessary to make any recommendation on the subject.

Preservatives in Butter.—Reference was also made to the use of preservatives in butter. It does not appear that the trade in

butter is unsatisfactory in this respect, but it does not seem that there are any adequate means in the present state of the law of checking any abuse of preservatives that may arise.

Butter Blending.—With regard to blended or factory butter, the Committee express the opinion that butter blending is a legitimate industry, but the evidence showed that in some cases water is added to factory butter in the process of blending for the purpose of increasing the weight, and recommendations 4 and 14 are directed to the prevention of this practice.

The attention of the Committee was also called to the practice of blending foreign and Colonial butters in this country and selling them under descriptions which lead the public to suppose that they are home-made butters. This is a practice which the Committee think undesirable, but it is one which will be checked under the existing law when efficient inspection is established.

Milk-blended Butter.—The Committee think it would not be desirable to prohibit the manufacture or sale of the substance known as milk-blended butter, as it appears that this substance meets the wants or suits the tastes of a certain section of the community; but they consider that it is not butter; that it and other substances (not being margarine) containing butter fat should only be allowed to be manufactured for sale under a special name and regulations approved by the Board of Agriculture and Fisheries; and that when sold by retail it should be delivered to the purchaser in a wrapper, also approved by the Board of Agriculture and Fisheries. (*See* recommendations 15, 16 and 17.) It would be necessary that factories where this mixture is made, and the premises of wholesale dealers who deal in it, should be registered, and that books should be kept on these factories and premises by which consignments of this mixture could be traced to the retailer.

Inspection of Factories.—In view of the evidence received as to the adulteration of butter and the irregularities connected with the sale of margarine, the Committee are convinced that the law controlling the trade in butter and butter substitutes requires amendment, and their recommendations on the subject of the control and inspection of factories and other matters are given above.

Penalties.—With regard to the subject of penalties, many witnesses suggested that penalties should be increased, but the Committee state that while it is evident that the existing law is not sufficient to prevent adulteration, the principal difficulty is that of bringing the real offender before the Courts, and it does not appear that this difficulty would be met by increasing penalties only. In the case of imported butter, the Committee think the penalty should be in proportion to the amount imported.

Voluntary Control of Butter Manufacture.—The Committee also enquired into and considered the voluntary system of control of butter manufacture in the Netherlands, but they do not think that any voluntary system of control would be effective in this country.

Ear-marking of Margarine.—One of the chief difficulties in checking the adulteration of butter under the existing law is that where the adulteration of butter with fat not derived from milk is carried out scientifically it is extremely difficult for analysts to certify to the adulteration. The suggestion has been made that the analytical difficulty in the way of detecting adulteration of butter with margarine might be surmounted by requiring all margarine manufactured in the United Kingdom or imported from abroad to contain a certain percentage of some ear-marking substance.

If this suggestion applies only to the article recognised in the trade as margarine it is futile, as such margarine is not generally used at the present time to adulterate butter. Other fats and oils are more generally used for this purpose. If, on the other hand, the meaning of the word margarine is extended so as to include all fats and oils which are capable of being used as adulterants of butter, then the objection arises that many fats and oils capable of being used for adulteration of butter are used by many industries not connected with butter. Sesame oil and starch were the two ear-marking substances recommended to the Committee. Objections were urged against the use of both of these substances.

Legislation as to Sale.—More drastic legislation as to the sale of butter was recommended, but it appears that under any provisions relating to sale it may be necessary to prosecute the

innocent retailer in order to reach the guilty party, and that the intricate nature of the law relating to warranty may prevent the prosecuting authority from reaching the guilty party altogether.

The Report of Dr. Thorpe upon the work of the Government Laboratory shows that the number of samples analysed in connection with the Board of Agriculture and Fisheries in the year ended 31st March, 1906, was 2,590. Of this number 2,319 were samples of imported dairy produce and margarine taken at the ports by officers of Customs, after consultation with the Board of Agriculture, in accordance with the provisions of Section 1 of the Sale of Food and Drugs Act, 1899.

**Analysis of
Samples at the
Government
Laboratory.***

Butter.—Out of 1,875 samples of imported butter, 937 or 50 per cent. were found to contain boron preservative and 617 or 33 per cent. were found to contain added colouring matter.

As compared with last year there has been a decrease of 235 in the number of samples of butter analysed. This is due to the fact that in revising the arrangements for the year it was decided to sample somewhat less frequently certain classes of butter, to the genuineness of which little suspicion could attach, and to bestow more attention upon butter coming from quarters which previous experience had shown to be concerned in the exportation of butter of doubtful purity. With the accumulation of more analytical data, and with the advantage of other aids not formerly available, it has been found possible, in spite of the absence of legal limits, to detect admixtures of other fats with butter in a considerable number of cases, and to prove the adulteration to the satisfaction of the magistrates. In some instances not only was the butter adulterated with foreign fat, but the quantity of water in the butter was greater than is allowed by the Sale of Butter Regulations.

In seventy-one cases where the butter was found to be sophisticated the results were submitted to the Board of Customs for consideration, with a view to legal proceedings being taken by that Department against the importers. Convictions have, so far, been obtained and penalties imposed in thirteen cases. The remain-

* Cd. 3032. Price 3d.

der are still *sub judice*, with the exception of a few cases which, for various reasons—as, for example, where two or more samples referred to the same importation—were not proceeded with.

Margarine.—There is good reason to believe that a notable amount of butter adulteration takes place in this country, the substances employed for fraudulent addition to butter being, amongst others, fats such as are imported in quantity for the manufacture of confectionery, or as constituents of shop margarine. The last-mentioned usages are, of course, quite legitimate; but there is no doubt that the fats in question are in some cases fraudulently mixed with butter.

To assist in tracing the destination of imported margarine, and to guard against the diversion of this substance into improper channels, the Legislature has enacted that all packages of margarine imported into the United Kingdom shall be conspicuously marked “Margarine.” During the past year a number of samples of the fats referred to have been submitted by the Customs in order to ascertain whether, having regard to their composition and properties, the fats in question came within the legal definition of margarine, and ought, consequently, to be so marked. Ninety-two such samples were examined, and in the case of fifty-nine the article proved to be margarine. Proceedings were instituted by the Customs Department to ensure that the substances should be properly marked in future. Generally these proceedings were successful in their object, but in the case of two of the fats the magistrates decided that the substances were not, legally, margarine, apparently on the ground that to come within the legal definition the article must so closely simulate butter as to be indistinguishable therefrom except by analysis.

Cheese.—Of the eighty-eight samples of cheese examined, forty-four were imported from Holland, twenty-two from Canada, fifteen from the United States (two being indicated as Canadian produce), five from France, and two from Belgium. Ten samples were “skim-milk” cheese, containing in one instance only 3·3 per cent. of fat. All these ten samples came from Holland.

Milk and Cream.—Samples of fresh and sterilized milk to the number of fifty were taken during the year, as well as 131 samples of condensed milk and eighty-three samples of cream.

Thirty-one of the samples shown as "condensed" milk were "milk powder" or "dried milk," and in one instance the goods were described as "humanised" condensed milk. In twenty cases the condensed product was found to have been prepared from milk deficient in fat, or from skim milk, without the packages being marked to this effect. In certain of these cases proceedings were instituted against the importers by the Commissioners of Customs, and penalties were imposed.

Of uncondensed milk, a smaller number of samples are described as fresh, and a much larger number as "sterilized" than was the case last year. Four of the samples were found to be deficient in fat, and in six other instances the milk was not entirely satisfactory; these were reported to the Commissioners of Customs, who initiated legal proceedings in such cases as seemed to demand this step.

Four of the samples forwarded as "cream" were shown by the analyses to be merely condensed milk. In the true cream the percentage of fat was found to range from 24·7 to 57·9 per cent., and most of the samples contained boron preservative. Some of the specimens of cream had been thickened by the addition of gelatin, and proceedings were instituted by the Commissioners of Customs against the importers. Technical legal objections were, however, raised at the hearing of the cases, and these objections were upheld except in one instance, where the points are still *sub judice*.

Sheep Dips.—It has been necessary to analyse sheep dips submitted by manufacturers to the Board of Agriculture and Fisheries in order that the Board might be advised what articles, having regard to the dipping tests made by the Departmental Committee, might possess a *prima facie* claim to be included in the official schedule as efficient preparations. During the year 221 such products have been analysed and reported on, twelve of these coming from the Department of Agriculture and Technical Instruction for Ireland. In the great majority of cases the chemical constituents of the dips were found to be, in fact, substantially what they were stated to be.

Miscellaneous.—The greater number of the samples included under this head consisted of butter other than that sampled by the Customs on importation, and of substances used in the adul-

teration of butter. Such information as the Board of Agriculture required in reference to these articles was deduced from the results of the analyses and duly reported to the Board.

Amongst the other miscellaneous samples submitted were two specimens of "blue vitriol," solutions of which are used by farmers for dressing wheat as a preventive of "smut." One of the samples proved to be adulterated with no less than 82 per cent. of sulphate of iron or "green vitriol." A powder used for dressing sheep was also forwarded for examination, and proved to be ordinary flour.

There were also a number of samples referred by magistrates to the Government Laboratory under the provisions of the Sale of Food and Drugs Act and the Fertilisers and Feeding Stuffs Act.

The complete volume of agricultural statistics for 1905, published by the Board of Agriculture and Fisheries, which is prefaced by a Report by Major Craigie, brings together the information collected in the agricultural returns already separately issued, and furnishes particulars of the imports and exports of agricultural produce, the prices of corn, of live stock and other commodities, together with the latest statistics relating to the agriculture of British possessions and foreign countries.

**Agricultural
Statistics, 1905.***

The Annual Returns for 1905 complete a series of forty years' official records, the particulars as to the acreage under crops in Great Britain having been first published by the Board of Trade in 1866, and advantage is taken of this fact to describe briefly the gradual development of statistical data respecting the agricultural position of this country since that time.

Major Craigie, in the course of his Report, deals with many points of general interest in connection with the distribution of the cultivated surface, changes in crop areas, produce of crops, and numbers of live stock, among which may be mentioned a valuable deduction which is drawn from a comparison of the area of land farmed by owners at different dates. The earliest figures available on this point are those for the year 1888,

* *Agricultural Statistics, 1905*, Cd. 3061, Price 1s. 6d.

when the owner-farmed land was returned as forming 15 per cent. of the whole, the remaining 85 per cent. being occupied by tenants in the more customary form of British farming. The circumstances of the earlier years of agricultural depression doubtless tended to throw considerable areas of untenanted holdings on their owners' hands, and in some of the arable districts, the proportion of owner-farmed land was much higher. The yearly tables suggest a slight but somewhat continuous reduction in the extent of owner-farmed land, which may not improbably be due to some recovery in agricultural prospects. The English average had fallen from 15·9 per cent. in 1888 to 14·9 in 1895, and for the year 1905 it stood at 13 per cent. only, while nearly everywhere the county average had declined. The group of counties, viz., Surrey, Sussex, Berkshire, and Hampshire, which in 1888 showed the highest percentage of owner-farmed holdings, 25 to 35 per cent., still stands high in this respect, and the first-named county has now even a higher percentage than before.

The tendency in each of the agricultural divisions of Great Britain is, however, towards a reduction of farm land occupied by its owners, and though the movement reveals great differences in its rate of progress, Major Craigie considers it may be attributed to a readier disposition to hire agricultural land than prevailed seventeen years ago.

The system of the direct collection of returns of market prices by specially appointed officers of the Board, which was started in 1904, was further developed in 1905, and some slight changes were made in the list of markets from which returns are obtained. Several tables of prices based on these returns appear in the annual volume for the first time.

Major Craigie also discusses in some detail the figures which are available from foreign countries relating to the area of wheat, and also as to the number of live stock. In speaking of the latter subject, he observes that in its animal wealth the agriculture of the British Empire, with its Indian possessions, has a pre-eminence which it does not even share with its great wheat-producing competitors, for it very conspicuously distances them all, as indeed it does in its human population. No other flag covers, as does that of our country, a herd of 120,000,000 head

of cattle, including in this total the herds of Indian buffaloes. The United States with 67,000,000 cattle, and the Russian Empire with 45,000,000 come next in magnitude, these two states standing ahead of all other nationalities. In sheep the British Imperial total reaches 157,000,000 head, somewhat over half standing to the credit of our Australian Colonies. The latest Argentine estimates—though the totals are somewhat uncertain—also appear to reach about half the flocks of the British Empire, while, including goats, the Russian flocks are estimated at 65,000,000, and those of the United States at 45,000,000.

The Report concludes with an analysis of the numbers of cattle and sheep in fourteen European countries, showing the proportion of each to every 1,000 acres of total surface, and also to every 1,000 persons.

The Board have now received a copy of the Programme of the meeting of the Eighth International Agricultural Congress, to be held in Vienna from the 21st to 25th of May, 1907, of which particulars were given in this *Journal* in June last (p. 178).

**Agricultural
Congress at
Vienna.**

The programme gives a list of the various papers which will be read and discussed in the eleven sections of the Congress, seven subjects and upwards being put down for discussion in each section. A few of them may be mentioned as an indication of the character of the Congress: Section I., for instance, will discuss, among other subjects, the connection between the International Agricultural Congress and the International Institute at Rome; the world's crops and statistics of consumption; the taxation of agriculture; and the formation of an international labour bureau. In Section II. eight papers are proposed in connection with agricultural education. A prominent subject which will come under notice (Sections II. and III.) is the replacement of nitrate of soda by nitrogen chemically produced, and by other means; and papers in this connection are promised by Dr. Birkeland and by Dr. Frank. The proper organization of agricultural experiments and the cultivation of moorland are also included in Section II. The classification

of brewing barley from a technical and agricultural point of view, with especial regard to its content of nitrogen, will be considered by several sections, while a number of other papers deal with malting and brewing. In view of the importance of the potato crop on the Continent, several sections propose to consider the measures to be employed for maintaining the successful cultivation of potatoes in Europe, and avoiding the consequences of over-production on the one hand or of bad crops on the other. The importance of cereal cultivation in Central Europe will also be brought forward. The best means of combating tuberculosis in cattle, the sanitary control of dairy products, principles of pig-breeding, and other matters relating to live stock and dairying, as well as poultry and bee-keeping, will be included in Section IV.; while the other sections cover such subjects as meteorology, drainage, sugar, the starch and spirit industries, prevention of plant diseases, forestry, fresh-water fisheries, vine-growing, and fruit cultivation.

The rates of wages of farm labourers in England and Wales, according to a report in the *Labour Gazette*, showed, on the whole, a very slight downward tendency in 1905, but in the great majority of rural districts there was no change. In Scotland the reports received show a rather more marked downward movement than in the case of England and Wales. So far as is indicated by reports received during July, agricultural wages in England and Wales have remained practically stationary in 1906.

**Wages of
Agricultural
Labourers in
1905 and 1906.**

In the table given on the next page the changes in wages disclosed by these returns are given in combination with the estimated number of agricultural labourers in the rural districts affected* for the ten years 1896-1905.

The figures show that in the period 1897-1901 there was a decided upward movement in agricultural wages. In the three following years (1902-4) the upward movement was far less marked, while in 1905 there was a slight downward tendency.

The estimated net decrease in 1905 in the districts in which

* Further particulars respecting the method of computing changes in agricultural wages are given in Report on Changes of Rates of Wages and Hours of Labour, Cd. 2,674 of 1905. Wyman and Sons, Ltd. Price 7d.

changes were reported, amounted to a general fall of £190 per week in the wages of those affected, as compared with a rise of £581 per week in 1904.

Year.	Total number of labourers in districts in which the predominant rates of wages		Computed amount of change in weekly cash wages of the labourers in districts affected.		
	In-creased.	De-creased.	In-crease.	De-crease.	Net in-crease (+) or de-crease (-).
	No.	No.	£	£	£
1896	52,721	36,676	1,858	1,513	+ 345
1897	72,559	4,340	2,232	110	+ 2,122
1898	183,987	2,356	6,227	47	+ 6,180
1899	163,960	208	5,438	4	+ 5,434
1900	230,635	—	8,150	—	+ 8,150
1901	127,565	10,469	3,559	398	+ 3,161
1902	51,949	41,705	1,609	1,297	+ 312
1903	51,095	24,953	1,449	893	+ 556
1904	23,779	9,569	1,032	451	+ 581
1905	6,659	12,438	252	442	- 190

Returns have been received from 180 correspondents in England and Wales which afford some indication of the course of agricultural wages in the present year. Of the 180 returns, 162 show no change in 1906, 10 show a downward tendency (chiefly in Yorkshire and Lincolnshire), and 8 an upward tendency (chiefly in the Midland and Eastern Counties).

Information as to the rates of wages agreed upon at hiring fairs in Scotland in 1905 was obtained by the Department from a correspondent, who reported that while at the hirings held from August to December, 1904, there was a downward tendency in the wages of male farm servants, which were, generally speaking, reduced by £1 to £2 for the half-year, this tendency was checked at the spring hirings in 1905, yet only in exceptional cases were the rates restored to the level of the previous year. At the hirings held in the latter half of 1905 the downward movement was resumed, and wages generally showed a fall of from £1 to £1 10s. per half-year. In some cases, however, farm servants remaining in their places sustained no reduction.

ADDITIONS TO LIBRARY DURING JULY.

Africa—

Cape of Good Hope.—Superintendent of Agricultural Co-operation, Report for 1905-6. (56 pp.) Government Biologist, Report for 1904. (40 pp.) 1906. Acting Director of Agriculture, Report for 1905. (128 pp.)

Australia—

Department of Agriculture, Victoria.—The Rusts of Australia. (349 pages + 55 plates.) 1906.

France—

Farines, A.—Guide Pratique et Élémentaire pour l'Examen et l'Analyse des Laits. (178 pp.) 1905.

Germany—

Ludwig, Dr. F.—Die Gesindevermittlung in Deutschland. (167 pp.) 1903.

Great Britain—

Pratt, E. A.—The Transition in Agriculture. (354 pp.) 1906.

Collings, the Right Hon. Jesse.—Land Reform. (452 pp.) 1906.

Castle, R. Lewis.—The Book of Market Gardening. (170 pp.) 1906. [Hand-books of Practical Gardening, Vol. XXVII.]

Barter, J. F.—Mushrooms and How to Grow Them. (44 pp.) 1906.

Holland.

Departement van Landbouw.—Verslag No. 4, 1906 :—Verslag over den Landbouw in Nederland over 1905. (162 pp.) 1906.

India—

Department of Agriculture for India.—Forest Bull. 4 :—*Ficus Elastica*. Its Natural Growth and Artificial Propagation. (35 pp.) 1906.

Hongkong.—Report of the Botanical and Forestry Department for 1905. (14 pp.) 1906.

United States—

Wilder, F. W.—The Modern Packing House. (581 pp.)

Department of Agriculture.—Report No. 82 :—Progress of the Beet-Sugar Industry in the United States in 1905. (130 pp.) 1906.

Bureau of Animal Industry :—

Bull. 84 :—Investigations into the Manufacture and Storage of Butter. I. The Keeping Qualities of Butter made under Different Conditions and Stored at Different Temperatures. (24 pp.) 1906.

Bull. 86 :—Experiments with Milk Artificially Infected with Tubercle Bacilli. (19 pp.) 1906.

Biological Survey.—Bull. 25. Birds that Eat the Cotton Boll Weevil. (22 pp.) 1906.

Farmers' Bulletins :—

No. 257. Soil Fertility. (39 pp.) 1906.

No. 258. Texas or Tick Fever and its Prevention. (45 pp.) 1906.

No. 259. Experiment Station Work, XXXV. (32 pp.)

Forest Service.—Bull. 73. Grades and Amount of Lumber Sawed from Yellow Poplar, Yellow Birch, Sugar Maple, and Beech. (30 pp.) 1906.

Bureau of Soils :—

Bull. 33. Calcium Sulphate in Aqueous Solutions. (71 pp.) 1906.

Bull. 34. Reclamation of Alkali Soils. (30 pp.) 1906.

Connecticut Agricultural Experiment Station.—Report for 1905. (368 pp.)

Wisconsin Agricultural Experiment Station.—Bull. 127. The Principles and Practice of Horse-Breeding. (128 pp.) 1905.

West Indies—

Imperial Department of Agriculture.—Sugar Cane Experiments in the Leeward Islands. Part II. Manurial Experiments. (53 pp.) 1906.

Board of Agriculture, Bermuda.—Report for 1905. (29 pp.)

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of July, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 11	7 6	37 9	34 9
Herefords ...	7 10	7 2	—	—
Shorthorns ...	7 7	7 1	37 0	34 3
Devons ...	8 0	7 5	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves ...	d. 7½	d. 7	d. 8½	d. 6½
Sheep :—				
Downs ...	8½	7¾	—	—
Longwools ...	8	7¼	—	—
Cheviots ...	9¼	8¾	9¼	8½
Blackfaced ...	8¼	7¾	9½	8¼
Cross-breds ...	8½	7¾	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs ...	6 9	6 3	6 4	5 9
Porkers ...	7 2	6 8	6 11	6 2
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 2	16 17	20 15	16 8
„ —Calvers ...	19 8	16 12	19 7	16 4
Other breeds—In Milk ...	17 18	14 1	18 5	15 1
„ —Calvers ...	18 0	14 10	18 5	14 19
Calves for Rearing ...	2 0	1 12	2 7	1 12
Store Cattle :—				
Shorthorns—Yearlings ...	8 16	7 6	9 1	7 11
„ Two-year-olds ...	12 9	10 18	13 5	11 18
„ Three-year-olds ...	15 11	13 17	15 4	13 3
Polled Scots—Two-year-olds ...	—	—	14 14	12 8
Herefords— „	15 18	14 4	—	—
Devons— „	11 8	10 11	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	35 1	30 10	—	—
Scotch Cross-breds ...	—	—	40 3	35 6
Store Pigs :—				
Under 4 months ...	30 5	23 6	27 7	20 1

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of July, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—							
English	1st	50 6	50 0	52 6	—	56 0*	57 0*
	2nd	48 0	46 6	48 0	—	—	49 6*
Cow and Bull ...	1st	—	43 6	43 0	39 0	43 6	41 6
	2nd	—	39 0	36 6	35 6	36 0	36 6
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	48 6	48 0	47 0	48 0	49 0	49 6
	2nd	44 0	43 6	43 0	43 6	—	46 6
Argentine Frozen—							
Hind Quarters ...	1st	30 6	32 6	31 0	30 6	32 6	34 0
Fore „ „	1st	21 0	23 0	21 6	21 6	23 6	23 6
Argentine Chilled—							
Hind Quarters ...	1st	37 0	38 0	36 6	35 0	—	40 6
Fore „ „	1st	24 6	25 0	25 0	25 6	—	27 0
American Chilled—							
Hind Quarters ...	1st	53 6	52 6	52 6	52 0	51 6	55 0
Fore „ „	1st	32 0	31 6	31 0	31 0	32 0	33 0
VEAL :—							
British	1st	61 0	60 6	63 6	65 6	—	—
	2nd	57 6	46 6	58 6	60 6	—	—
Foreign	1st	64 0	—	—	—	—	60 6
MUTTON :—							
Scotch	1st	80 0	—	76 0	74 6	82 0	74 6
	2nd	75 0	—	70 6	70 0	69 0	59 0
English	1st	71 6	69 0	73 6	70 0	—	—
	2nd	63 0	56 0	68 0	64 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	—	—	—	48 0	—
Argentine Frozen ...	1st	31 0	33 0	34 6	34 6	33 6	34 6
Australian „ „	1st	31 6	29 6	32 0	32 0	33 6	—
New Zealand „ „	1st	38 0	34 6	39 6	39 6	33 6	34 0
LAMB :—							
British	1st	84 0	73 0	74 0	73 6	83 0	77 6
	2nd	76 0	68 0	69 0	69 0	76 0	71 0
New Zealand ...	1st	48 6	49 6	47 0	47 0	49 0	51 6
Australian	1st	39 0	43 6	42 0	40 0	40 6	37 6
Argentine	1st	—	43 6	—	—	40 0	—
PORK :—							
British	1st	57 6	60 6	56 6	58 6	56 0	52 0
	2nd	53 0	55 0	52 0	54 0	52 0	49 0
Foreign	1st	57 0	58 6	58 6	58 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (<i>in</i> 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21 ...	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28 ...	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5 ...	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12 ...	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19 ...	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26 ...	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2 ...	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9 ...	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16 ...	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23 ...	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30 ...	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7 ...	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	2
" 14 ...	26	10	32	3	30	5	18	9	23	10	23	8	17	6	19	7	20	4
" 21 ...	27	7	32	2	30	3	18	10	23	7	23	2	17	6	18	11	20	5
" 28 ...	28	0	32	3	30	5	19	9	23	11	22	4	17	10	19	3	20	2
Aug. 4 ...	28	3	31	11	30	9	19	9	22	0	22	1	17	10	18	4	19	3
" 11 ...	28	4	30	5			19	9	22	5			17	7	16	11		
" 18 ...	28	8	28	5			22	5	23	4			16	7	16	4		
" 25 ...	29	5	27	1			23	2	23	6			16	5	15	9		
Sept. 1 ...	30	2	26	11			25	3	23	5			16	3	15	9		
" 8 ...	30	0	27	1			24	10	23	4			16	1	15	11		
" 15 ...	29	7	26	11			24	9	23	7			15	11	16	0		
" 22 ...	29	10	26	8			25	10	23	10			15	9	15	11		
" 29 ...	29	10	26	9			25	5	24	3			15	8	16	1		
Oct. 6 ...	30	2	26	9			25	6	24	9			15	9	16	3		
" 13 ...	30	5	26	11			25	4	24	10			15	8	16	6		
" 20 ...	30	4	27	1			25	5	25	0			15	11	16	7		
" 27 ...	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3 ...	30	6	27	10			25	0	24	9			16	0	17	1		
" 10 ...	30	3	28	3			24	6	24	10			15	11	17	4		
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	6	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

			WHEAT.		BARLEY.		OATS.	
			1905.	1906.	1905.	1906.	1905.	1906.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France :	April	...	40 4	39 10	24 6	25 3	19 9	22 4
	May	...	40 10	39 10	24 11	25 6	20 7	22 9
	June	...	41 0	38 11	25 3	25 5	21 6	23 0
	July	...	40 10	40 0	25 5	25 4	21 8	23 5
Paris :	April	...	41 3	40 2	25 9	25 5	20 5	23 3
	May	...	42 6	39 5	25 10	25 10	22 4	23 0
	June	...	42 5	39 3	26 3	26 5	23 1	23 8
	July	...	42 4	40 7	26 2	26 7	22 10	24 7
			1904.	1905.	1904.	1905.	1904.	1905.
Belgium :	December	...	31 1	31 1	23 2	23 10	19 11	21 3
			1905.	1906.	1905.	1906.	1905.	1906.
Belgium :	January	...	30 7	30 10	23 6	23 6	20 1	21 9
	February	...	30 0	30 11	23 5	24 4	19 10	21 9
	March	...	30 10	30 3	23 8	24 6	20 6	21 5
	April	...	30 8	30 6	23 10	24 7	20 5	21 7
	May	...	30 11	30 8	23 10	24 5	21 2	22 5
	June	...	31 8	29 9	24 0	24 2	21 8	22 4
Berlin :	June	...	37 11	39 10	—	—	20 0	23 8
Breslau :	June	...	{ 35 2	36 10	24 6	27 0 (brewing)	19 3	23 3
					—	24 7 (other)		

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of July, 1905 and 1906.

			WHEAT.		BARLEY.		OATS.	
			1905.	1906.	1905.	1906.	1905.	1906.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	...	...	32 10	31 6	—	23 5	20 1	—
Norwich	...	...	31 10	30 1	22 9	19 1	18 7	19 10
Peterborough	...	...	31 5	30 1	—	22 3	19 5	19 6
Lincoln	...	...	31 4	28 11	22 9	—	—	20 0
Doncaster	...	...	30 10	28 4	—	—	18 8	19 5
Salisbury	...	...	32 2	30 8	—	—	19 11	20 9

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of July, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British ...	12 6	10 9	—	—	—	—	13 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish ...	105 0	102 0	105 6	103 0	104 0	100 0	104 0	94 0
Danish ...	113 0	110 6	114 6	112 6	114 6	110 6	113 0	—
Russian ...	98 6	95 0	106 0	102 6	97 0	94 0	97 6	92 6
Australian ...	104 0	93 6	—	—	—	—	99 6	—
New Zealand ...	107 0	100 6	—	—	—	—	105 6	—
CHEESE :—								
British, Cheddar	65 0	61 6	—	—	70 0	66 0	62 6	58 6
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	58 0	53 0	63 0	58 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	58 6	57 0	59 6	58 0	57 6	56 6	58 0	56 6
BACON :—								
Irish ...	71 6	66 6	70 0	68 0	69 6	66 6	66 0	63 6
Canadian ...	64 6	63 6	60 0	57 0	63 0	58 6	62 6	60 6
HAMS :—								
Cumberland ...	107 0	95 0	—	—	—	—	—	—
Irish ...	104 6	95 0	—	—	—	—	101 6	95 6
American (long cut) ...	67 0	63 0	66 6	62 6	69 0	65 6	66 0	62 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British ...	11 0	9 4	—	—	—	—	—	—
Irish ...	9 3	—	8 7	7 11	8 4	7 8	9 6	7 11
Danish ...	9 7	8 7	9 6	8 1	—	—	8 10	7 11
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Myatt ...	140 0	105 0	—	—	123 6	113 6	—	—
Puritan ...	90 0	70 0	—	—	86 6	76 6	—	—
HAY :—								
Clover ...	92 6	79 6	100 0	83 6	100 0	77 6	88 6	80 0
Meadow ...	82 6	73 6	96 6	—	—	—	88 6	80 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JULY.		7 MONTHS ENDED JULY.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	78	93	712	515
Swine Slaughtered as diseased or exposed to infection ...	499	381	3,939	2,405
Anthrax :—				
Outbreaks	40	55	563	590
Animals attacked	69	73	840	823
Glanders (including Farcy) :—				
Outbreaks	97	98	667	725
Animals attacked	201	171	1,255	1,258
Sheep-Scab :—				
Outbreaks	6	5	293	648

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JULY.		7 MONTHS ENDED JULY.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	12	47	61	93
Swine Slaughtered as diseased or exposed to infection ...	120	379	714	845
Anthrax :—				
Outbreaks	—	—	3	2
Animals attacked	—	—	7	2
Glanders (including Farcy) :—				
Outbreaks	1	—	4	12
Animals attacked	1	—	11	33
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	4	3	150	225



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HOW LONG DOES LIME LAST IN THE SOIL?

The practice of liming or chalking the soil is one of the oldest and most widely-spread operations of British agriculture; unfortunately, it is a custom that is less observed at the present time than probably at any other period since farming became an organized industry. The value of lime was familiar to the Romans, its use persisted through the Dark Ages and it is mentioned in the mediæval treatises on agriculture, while from the sixteenth century onwards, coincidently with the growth of enclosures and the passing of the land into private hands, it became one of the indispensable acts of cultivation in this country. The eighteenth century writers down to the time of Arthur Young tell us how much the application of lime or chalk was part of the ordinary routine of the farm, and the same fact might be inferred from the numbers of decayed lime-kilns which are to be found all over the country, practically on every farm where a bed of limestone or chalk lies near enough to the surface to admit of digging it. Wherever the rock is hard, a limestone, it must be quarried and burnt to lime, but in many parts of the country softer beds of marl or chalk exist which can be applied directly to the land; the action being similar to, though more slow than, that of the burnt lime. In this part of Hertfordshire, where the soil consists of a stiff loam, almost a clay, of varying depths but probably averaging ten feet, and then resting upon the chalk rock, it has always been the custom to "chalk" the land. This was formerly done by sinking bell pits through the clay to the chalk

rock, which was then excavated, hauled to the surface, and spread over the adjoining land by sledges. Sixty to a hundred loads per acre were applied, and the process was repeated at intervals of six or ten years, as the farmer could spare the labour. The pits were generally filled with brushwood and rubbish, and left to fall in; most of the fields to-day show a depression due to this cause, known locally as a "dell," and the former excavation can generally also be detected by the presence of some subsoil clay, still raw and unkindly to work, round the edges of the hollow.

But in Hertfordshire, as elsewhere, comparatively little liming or chalking is nowadays to be seen. How is it that the practice has so much fallen into disuse? In the main, we must put it down to the increased cost of labour: the farmer is working with fewer hands on the farm, and no longer does he find occupation for them in the winter and other slack times by digging chalk or carting limestone from a distance. Liming and chalking have begun to pass into the category of practices like marling, claying, and sanding,—excellent operations, by which in the past certain soils have been created for farming purposes, but which are unjustifiable in these days of low returns for farm produce and high cost of labour. Something also must be set down to the introduction of artificial manures; by putting on bones or superphosphate of lime the farmer thought he was restoring lime to the land and was therefore absolved from any obligation to supply it more directly. But at the outset a clear distinction must be drawn between free lime, as it exists in quick lime or slaked lime, and the same lime combined with an acid, as in bones, where it is combined with phosphoric acid, or in gypsum, where it is combined with sulphuric acid. What is necessary for the soil is not so much the chemical substance lime, but a base—something capable of combining with the acids produced naturally or artificially in the soil. In quicklime or in slaked lime we have this base, and nothing else. Chalk and all natural limestones contain lime and carbonic acid, which, however, is so weak an acid that it is easily turned out and does not interfere with the basic properties of the lime, whereas in bones or gypsum the lime is already completely saturated with strong acids, and in superphosphate there is even an

excess of acid, which demands more lime from the soil to neutralize it. Quick lime and slaked lime when applied to the soil quickly go back to the state of carbonate of lime or chalk in which they existed before they were "burnt" in the kiln, hence it is really this substance, carbonate of lime, that we denote when we speak of "lime" in the soil. The superiority of burnt lime over chalk or limestone for application to the soil lies simply in the fact that it falls naturally into a fine state of division, some of it also passing into solution, so that it is more easily disseminated throughout the soil and acts with greater rapidity and in smaller quantities. But to return to the point at issue, only freshly burnt (quick) or slaked lime, chalk, limestone, and marl contain "lime" in the farmer's sense, *i.e.*, a base capable of neutralizing acids; in bones, in superphosphate, and in gypsum the lime is combined with acids, and is no longer capable of acting as a base.*

Owing to the former prevalence of the practice of liming, many of our soils, originally deficient in this important constituent, have been supplied with it in quantities sufficient for the health of the crops they carry; it is well known, however, that there are various natural agencies at work removing lime from the soil, and the question naturally arises how long a given dressing of lime or chalk may be expected to remain in the soil. The Rothamsted soils afford exceptional opportunities for determining this point, since all the carbonate of lime they contain has been applied artificially by the processes above described and remains in the top nine inches of soil, *i.e.*, in the layer which alone gets moved during the ordi-

* The compounds of lime of any agricultural importance may be tabulated as follows:—

1. *Bases*, capable of neutralizing acids.
 Quick lime, burnt lime, stone lime = lime.
 Slaked lime = lime and water.
 Chalk, limestone, marl, old mortar, &c. = lime and carbonic acid.
 Basic slag = lime and phosphoric acid (lime in excess).
2. *Neutral salts*, in which the lime is already neutralized by a strong acid.
 Gypsum = lime and sulphuric acid.
 Bones and mineral phosphates = lime and phosphoric acid.
3. *Acid salts* which contain more acid than the lime can neutralize.
 Superphosphate } lime and phosphoric acid in excess.
 Dissolved bones }

"Gas lime" consists of slaked lime more or less saturated with compounds of sulphur; it has but little basic property left in it and so cannot take the place of lime or chalk.

nary operations of cultivation. The soils of the various Rothamsted experimental fields are of similar origin and character, and consist of a reddish heavy loam or sandy clay containing a large but variable proportion of unworn flints with a few pebbles. The amount of carbonate of lime present is very small, less than one-fifth of 1 per cent., except in the surface layer, where from 2 to 5 per cent. is met with, disseminated through the soil in rounded grains of all sizes up to one-eighth of an inch in diameter. That this carbonate of lime is of artificial origin may be gathered from the following reasons:— (1) Its amount varies greatly from field to field, though the proportion in the subsoil below nine inches is much the same everywhere. (2) The Rothamsted fields lie at the highest level of a plateau; there are no higher lands near from which a chalky surface soil might have been washed. (3) On some of the fields the chalking process seems to have been omitted; the surface soil contains no more carbonate of lime than the subsoil. This again is the case with the soil of the adjoining Harpenden Common, land which has certainly never been under cultivation.

The following table will illustrate these points:—

PERCENTAGE OF CARBONATE OF LIME IN FINE DRY SOIL.

—	Broad-balk wheat.	Hoos barley.	Agdell rotation.	Little Hoos.	Harpenden Common.	Geescroft.
1st depth of 9 in.	3'3	2'3	4'5	2'7	0'21	0'16
2nd depth of 9 in.	0'12	0'20	0'17	0'12	0'14	0'13

The samples in question were all taken from unmanured plots in 1904-5; lower depths show practically the same content of carbonate of lime as the second depth.

From some of the Rothamsted plots samples of soil that were taken as far back as 1865 have been preserved, and in most cases a sample thirty years old exists, so that a comparison of the carbonate of lime in these old samples with those taken recently affords a means of determining the losses to which this substance has been subject. Certain technical difficulties concerned with soil sampling and the inevitable irregu-

larities in distribution of material like chalk, spread roughly by hand, renders great exactitude in the conclusions impossible, but the results from the various fields are in substantial agreement. Calculated over various periods of from 38 to 32 years, we obtain the following rate of loss of carbonate of lime per acre per annum on the unmanured land:—Broadbalk Field (continuous wheat), 800 lb.; Hoos (continuous barley), 1,000 lb.; Agdell (rotation), 930 lb.; Little Hoos (mixed farming), 1,050 lb.—figures which might at the outside require reducing by 20 per cent. to allow for a possible consolidation of the soil during the long period for which it has been cropped continuously without manure. Speaking generally, we may conclude that by natural causes alone the rain water will remove from an arable soil containing originally more than 1 per cent. of carbonate of lime about eight hundred to a thousand pounds per acre per annum, which is equivalent to about half as much freshly burnt or quick lime. When the amount of carbonate of lime in the soil is much less than 1 per cent. the rate of loss will be considerably reduced, though no data exist from which the diminution could be estimated. These losses are almost wholly due to the solubility of carbonate of lime in water containing carbonic acid; the pure rain water as it falls cannot dissolve carbonate of lime, but after picking up some of the carbonic acid, which is always present in the soil gases in large quantities, it becomes capable of dissolving out the carbonate of lime.

It should be noted that these results refer to arable land receiving no manure, and carrying in consequence only a small crop every year; whether the loss of carbonate of lime would be reduced with the smaller percolation through the soil, which would follow where larger crops were grown, or if the land were in grass, cannot be settled from the data in our possession. "Lime sinks in the soil" is a common farming maxim, but this conclusion is based upon frequent observations of a layer of chalk or lime a few inches, or even a foot or so, below the surface of old grass land. Such sinking of lime, &c., in grass land is, however, brought about by quite distinct causes, chiefly by the burying action of earthworms, which are always bringing the fine soil up to the surface. The action of earthworms has been investigated by Darwin, who found that the rate at which they bring the mould to the

surface is sufficient to bury things about one inch in every fifteen years. Cinders, stones, and any other substances on the surface of grass land are buried just as readily as lime or chalk, as may be seen by the fact that stones are never found lying on old grass land, however stony the neighbouring arable land may be. But on arable land, as the Rothamsted analyses show, there is no tendency for the lime to sink in the soil. Although it is certainly more than sixty-five years since the chalking there was done (probably, indeed, most of it took place more than a hundred years ago), yet the chalk still remains wholly in the top nine inches of the soil. Thus, while we know that lime sinks in the soil of grass land from purely mechanical reasons, in arable land it does not sink, but is subject to a steady wastage by solution in the rain water percolating through the soil.

The Rothamsted plots further enable one to answer another important question, the effect of the various manures usually applied to land upon the rate at which the carbonate of lime is washed out. Briefly the results of the investigation are as follows :—

(1) Superphosphate, sulphate of potash, kainit, and kindred manures do not increase the loss to any appreciable extent.

(2) Farmyard manure and probably all organic manures diminish the loss of carbonate of lime.

(3) Nitrate of soda also diminishes the loss.

(4) Sulphate of ammonia increases the loss, removing about half its own weight of lime or nearly its own weight of chalk.

The effect of sulphate of ammonia in removing lime from the soil has always been understood; the ammonium salts to a large extent behave like free acids, and have to be neutralized by carbonate of lime in the soil. Whenever the carbonate of lime becomes deficient then the continued use of ammonium salts actually gives rise to an acid reaction in the soil and may cause almost complete sterility, as in the case of some of the plots on the Royal Agricultural Society's farm at Woburn. In that soil there was at the outset of the experiments only a trace of carbonate of lime, and the continued use of ammonium salts for thirty years has made the soil so acid that barley will no longer grow and wheat is seriously affected. A dressing of lime, however, restores the soil to its normal condition. At Rothamsted

some of the grass plots are similarly acid through the use of ammonium salts, and though sterility has not resulted, both the amount and the character of the herbage have been very injuriously affected. The action of sulphate of ammonia is quite intelligible on ordinary chemical grounds, but the facts that farmyard manure and, again, nitrate of soda, protect the carbonate of lime in the soil from washing out require a little further consideration.

At first sight it would seem that the use of farmyard manure ought to result in an increased consumption of carbonate of lime; the organic matter in its decay produces certain ill-defined bodies we know as humic acids, also the nitrogenous matter must be "nitrified" before it reaches the plant, *i.e.*, it is actually converted into nitric acid and requires a base like lime for its neutralization if the process is to continue. Nitrification in particular must be taken into account; it is a process going on in all healthy soils, where practically the whole of the nitrogen reaching the crop has first to be nitrified and combined with a base from the soil, so that if we assume the average crop to contain 50 to 100 lb. of nitrogen per acre, then from 200 to 400 lb. of carbonate of lime will have been used up previously for this process. Yet many soils which contain a mere trace of carbonate of lime, retain their healthy condition year after year under ordinary farming. Nitrification goes on in these soils, acids are produced, but the soil does not become actually acid and infertile, provided no manure like sulphate of ammonia is applied in large quantities. It would be out of place here to go into the details of the solution of this problem, which has long been one of the difficulties in interpreting the chemistry of the soil, but the essential fact is that the plant, when growing under normal conditions and feeding upon salts dissolved in the soil water, does itself excrete or leave behind in the soil an amount of base sufficient to make up for the annual losses by nitrification. Thus when nitrate of soda, a ready-made nitrate removing no base from the soil, is used for manure, the plant which feeds upon it, by taking up more of the nitric acid than of the soda, actually increases the amount of base in the soil, so that the annual loss of carbonate of lime by drainage is diminished, as was found on the Rothamsted plots. Again,

where organic matter like farmyard manure decays, although humic acids are produced which combine with carbonate of lime in the soil, yet a still further stage of decay is brought about by other bacteria, and the material is still further oxidized to carbonate of lime again. Plant residues also contain salts like calcium oxalate which are resolved by soil bacteria into carbonate of lime. Thus the investigations demonstrate that a number of processes are normally going on in the soil which re-create the carbonate of lime consumed by nitrification and similar processes; the only loss of carbonate of lime which is not compensated for being its direct solution in rain-water containing carbonic acid, followed by percolation into the drains or the subsoil. When, however, the original stock of carbonate of lime in the soil is very small this loss by solution becomes greatly reduced and is negligible, so that the soil may retain a fairly healthy condition under ordinary farming.

It by no means follows, however, that a soil apparently healthy and showing no sign of approaching sterility will not be greatly benefited by a dressing of lime and chalk. The data are insufficient yet to enable us to fix the danger limit, but probably it lies between one-half and one-quarter per cent., and as soon as the carbonate of lime in the soil falls below that limit the productiveness declines in various directions.

Putting aside the manner in which lime neutralizes actual acidity in the soil, with its resulting sterility, the beneficial effects of lime are as follows:—

(1) It improves the texture of the soil by coagulating the finest particles of the clay and rendering the land drier and more friable. Drainage goes on more readily, the land is warmer, and it is more readily worked to a good tilth. It is difficult to exaggerate the value of this action of lime on the heavier soils; it often means that it is possible to secure a seed bed when the unlimed land is still too wet to work, and the character of the root crop, particularly swedes, depends more on securing a good tilth than on manuring. A good example of the value of lime in this connection may be gathered from the Rothamsted experiments. In former years one of the fields, Geescroft, was used for experiments upon beans and oats; the land, however, lay so wet, and was so difficult to work in the spring, that during

the cycle of wet seasons culminating in 1879 it was repeatedly found impossible to sow either crop. Eventually the experiments were abandoned and the field laid down to grass, as being unfitted for arable cultivation except in favourable seasons. There was nothing in the situation of this field to account for its wetness, and subsequent examination and analysis of soil and subsoil show that the only difference between this and the other Rothamsted fields lies in its lack of chalk or lime. While the other fields have from 2 to 5 per cent. of chalk in their surface soil, this field must have escaped the chalking process, for it contains practically none. Otherwise, when compared with the Hoos field, where barley is grown every year, its situation is similar, its soil is no heavier, and its subsoil is even a little lighter.

(2) The insoluble reserves of nitrogenous and potassic material in the soil are brought into action and rendered available for the plant by the presence of lime. The following table shows the result of applying in January, 1903, 2,000 lb. per acre of ground quick lime to some of the grass plots at Rothamsted, where there was a good deal of residue from past manuring locked up in the soil:—

—	PLOT 7.		PLOT 9.	
	Yield with mineral manures only.		Yield with complete artificial manures.	
	Unlimed.	Limed.	Unlimed.	Limed.
	cwt.	cwt.	cwt.	cwt.
1903 ...	49·5	51·9	50·1	60·5
1904 ...	61·9	61·8	63·7	69·8
1905 ...	44·3	47·2	36·9	52·2
1906 ...	34·4	41·4	39·0	50·0

(3) All the leguminous crops usually cultivated on a farm flourish much better when there is a good supply of lime in the soil. Clover, in particular, is very intolerant of acid soil conditions, and is much more subject to clover sickness when lime is deficient. In 1906 alsike clover at Rothamsted was almost a complete failure on a plot where the carbonate of lime had been reduced to about 0·3 per cent., though it was good on an adjoining plot with about 0·5 per cent.

(4) It seems to be established that the soil organism (*Azotobacter*), which fixes nitrogen without the aid of leguminous plants and is a great factor in the gain of fertility when land is laid down to grass, cannot develop properly unless there is a good supply of carbonate of lime.

(5) Turnips are always liable to "finger-and-toe" when lime is deficient in the soil.

It cannot be doubted that the fertility of many of our fields to-day is due to the liming and chalking that was done by the farmers of the eighteenth and earlier centuries; they, indeed, made the soil, for it is through their labours that it remains in profitable cultivation at the present time. Owing to the very large amounts of chalk and lime which were then applied, it has been possible for later generations to live upon the capital thus accumulated and dispense with any expenditure of their own in this direction. But this spending process cannot continue indefinitely, for natural causes alone—the percolating rain-water—are steadily removing the lime in the surface soil; for example, the Rothamsted soil, which at the beginning of the nineteenth century must have contained something like a hundred tons of chalk per acre, has now less than fifty, and many other soils which started with a smaller initial stock are beginning to run dangerously short. All over the country there is evidence that much of the land, especially on the heavier soils, is in need of liming, and though it would not be wise to return to the old wasteful dressings of six to ten tons to the acre, a much smaller quantity, half a ton or so per acre, could be profitably applied at least once in the course of each rotation.

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DODDER.

The question to what extent the various species of dodder are harmful to agricultural crops is one which is of considerable interest to the farming community, and for some years past the agricultural press has contained many references to the prevalence of the pest in various districts. Moreover, in 1905, as much as 11 per cent. of the clover seed samples examined by the Botanist to the Royal Agricultural Society were condemned owing to the presence of dodder seeds, while two samples of red clover contained no less than 6 per cent. Some information, therefore, on the several species of dodder, the methods by which they are spread, and the best means by which they may be suppressed or avoided, may at the present time be of value to agriculturists and seed merchants alike.

DESCRIPTION OF CERTAIN SPECIES OF DODDER.

Some eighty species of dodder are known to science, and of these several occur in Britain. Dodder is botanically included in the order *Convolvulaceæ* under the genus *Cuscuta*. The dodder plant is an annual, growing from seed either self-sown or sown with other seed, and it is parasitic on other plants of a higher order, germination, however, taking place in the soil. Four species or varieties are mentioned in Hooker's Flora of the British Islands, these being *Cuscuta europaea*, *C. epilinum*, *C. epithymum*, and *C. trifolii*, the most important being *C. trifolii*. Other species, however, which have been introduced with imported clover and other seeds, may cause much damage in European countries, these being *C. corymbosa* (of American origin), *C. Gronovii* (also American), and *C. monogyna*. All species are parasitic on other plants, and all have the same method of reproduction.

Cuscuta trifolii.—This species (Pl. I.), significantly termed "clover dodder," and, according to Hooker, a variety of *C. epithymum*, is the species commonly met with. It chiefly attacks red clover and lucerne. After a seed has once germinated the seedling quickly dies, unless a clover or other suitable plant be at hand, but, once established on a plant, it sends out roots or suckers (haustoria), which take firm hold of the host, loses its connection with the soil, and thereafter, unless checked, will rapidly

spread in all directions by means of its slender, thread-like stems, which twine round the plants from which the pest draws its sustenance. *C. trifolii* is quite leafless, but produces clusters of small white bell-shaped flowers, each of which yields a two-celled capsule. Each cell contains two seeds, a single flower, therefore, producing four.

C. epithimum.—The flowers of this species are variable in colour, and about $\frac{1}{4}$ to $\frac{3}{4}$ -in. in diameter, opening from July to October. The stems are reddish in colour and very slender. It occurs in Britain from Ayr southwards, in Europe from Denmark southward, in North Africa, and in Western Asia. It is also termed *C. minor*, or lesser dodder.

C. europaea.—In this species the stems are reddish or yellow in colour, and as thick as twine, the flower-heads being from $\frac{1}{2}$ to $\frac{3}{4}$ -in. in diameter, and tinged with red. Flowering takes place in Britain during the summer months, the species being found from York to Sussex and Devon; it is, however, rather rare in Britain. It is also found throughout Europe, in North Africa, and in Siberia. This species is also known as *C. major*, or greater dodder.

C. epilinum.—This species, flax dodder (Pl. II.), occurs sporadically on flax in Great Britain and Ireland, and is distributed throughout Europe. It is as large as the last species, but is paler and more succulent. It flowers during summer.

C. Gronovii.—This parasite, known as large American dodder, was identified in France by M. Schribaux some twenty-five years ago, when it appears first to have been introduced into that country from Canada or the United States. Owing to the fact that the seeds are about the same size as those of lucerne, they are with difficulty separated therefrom, and this renders the pest more dangerous. It is not believed that this species ripens its seeds in this country, but the seeds germinate when sown, and produce dodder plants which are quite able to kill their host plant.

C. monogyna and *C. corymbosa* (*C. Hassiaca*, or *C. suaveolens*) are also harmful to certain plants. The latter is of American origin, and bears large seeds.

LIFE HISTORY.

The embryo of the dodder seed is simple and thread-like, and



1.—CUSCUTA TRIFOLII ON TRIFOLIUM PRATENSE.

coiled spirally round the fleshy albumen, while the radicle is thickened. The seeds seem to germinate best during damp seasons. At a suitable temperature they will germinate in five to eight days. When a seed germinates the thread-like coil unwinds gradually, the radicle end taking root in the soil, the remainder meanwhile lengthening and when it reaches a suitable host commencing to twine itself round the stem, to which it attaches itself firmly by means of the suckers or haustoria. Should the thread-like stems fail to reach a suitable host plant, they die.

The plant now extends its thread-like stems to neighbouring plants, and large patches may rapidly become infested and overcome, the dodder soon leaving its hold of the soil, and living wholly on the host plant. On becoming firmly established the dodder grows and spreads rapidly, produces flowers, and if nothing be done, seeds are formed and the soil is re-sown. Small fragments of the stems, constituting veritable cuttings, may suffice to establish new centres of infestation, attaching themselves to fresh plants. But M. Marre states that dodder may also be spread by means of little tubercles, which are formed in winter.*

As stated above, however, dodders are annual seed-producing plants, and are no doubt chiefly distributed by seed included amongst agricultural seeds.

As regards the life-history and manner of growth, the various species closely resemble one another. The harm done is best explained by stating that dodder possesses no chloroplasts, and is unable to take up carbon dioxide from the air like ordinary green plants, but after leaving its hold of the soil, it depends entirely for its food material on the ready-made products which it absorbs from its host plant, which therefore becomes exhausted and dies. So rapidly does the pest spread that it has been stated that in three months a single stem may kill all the clover or lucerne plants on an area of twenty-eight square metres (thirty square yards nearly), and so complete is the destruction that one would say a fire had passed over the spot. Infested plants may be said to present the appearance of being wound about with reddish or yellow threads.

* E. Marre, *La Lutte contre la Cuscuta*.

DESCRIPTION OF DODDER SEEDS.

The seeds of most species of dodder are very small—usually much smaller than the seed of red clover—roundish, and angled. It may be stated that they are generally smaller than the seeds of the plants on which they are parasitic. Exception must be made, however, in the case of large American dodder, *C. Gronovii*, which is much larger than the seed of most species. The seeds of *C. trifolii* are roundish, about 1 m.m. in diameter, dull in appearance, and grey, brown, olive-brown, or yellowish-brown in colour. In the case of *C. epithymum* the seed is round-oval in shape, and yellowish-brown in colour.

Dodder seeds can soon be recognised with a little practice, but cannot be certainly identified without the aid of a pocket-lens, or a slightly enlarging microscope.

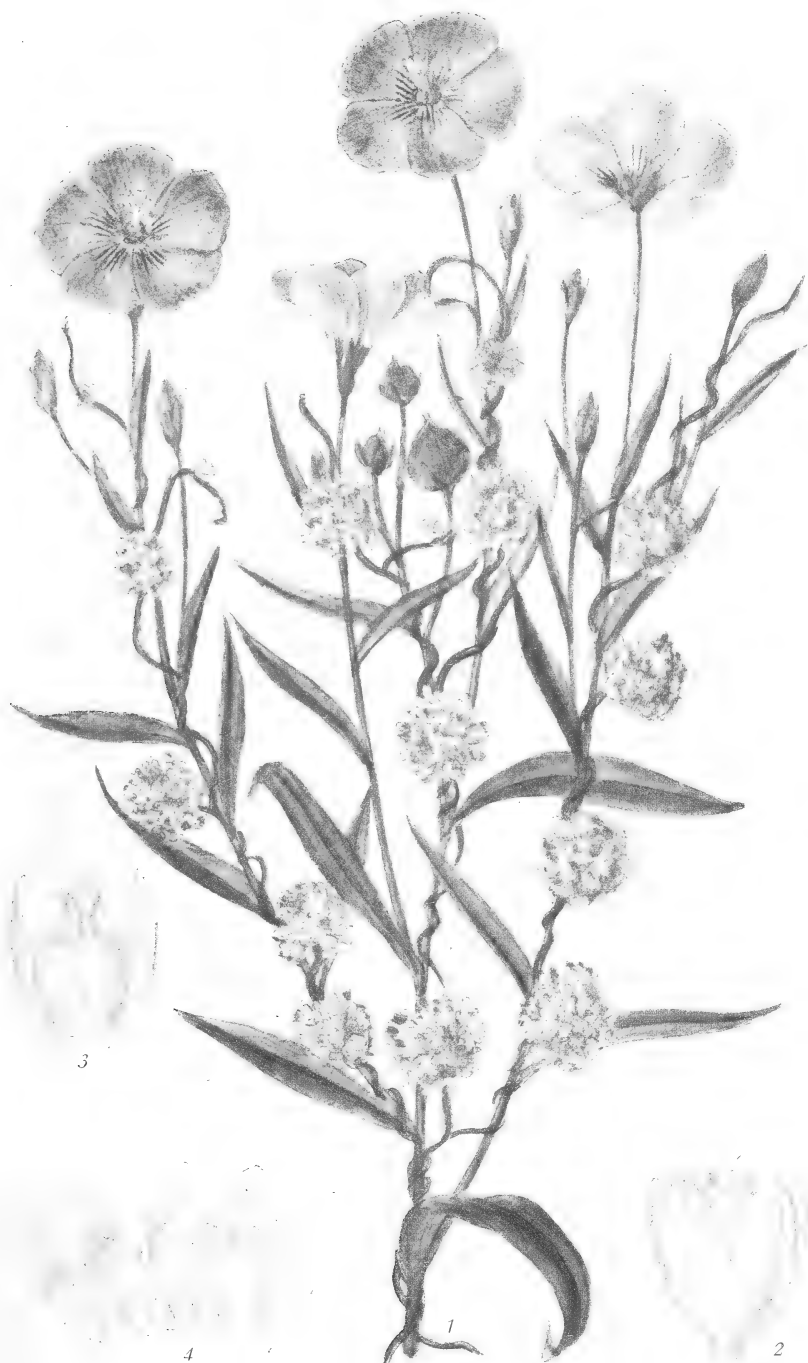
PLANTS ATTACKED.

The cultivated crops attacked by the various species are numerous, the most important, however, being clover and lucerne.

C. trifolii.—This variety is that which is most commonly found on clover and lucerne in Great Britain. According to Frank, however, it has been found on vetches, lupines, potatoes, beet, carrots, fennel, aniseed; not infrequently the wild species *C. epithymum*, of which *C. trifolii* is a variety, is found in meadows and pastures, on heaths, &c. M. Marre cites also *Lotus corniculatus*, lavender, and other labiates, St. John's wort, species of heaths, *Achillea millefolium*, and even (according to Prillieux) such graminaceous plants as ryegrass, as having been noticed attacked by this species. He observes, however, that very probably in some cases the dodder is merely entwined round the plants, and not attached to them by means of its suckers. *C. epithymum* is also found on furze, thyme, and ling.

C. europaea.—In Britain, this species is found on vetches, nettles, &c. In France, it is recorded as living on hops, hemp, vetches, potatoes, the vine, acacia, poplar, aconite, and other plants.

C. epilinum.—Known as flax dodder; this species chiefly attacks flax, but on the Continent it is found also on hemp and camelina.



II.—CUSCUTA EPILINUM ON LINUM USITATISSIMUM.

C. Gronovii.—Besides attacking lucerne, and without doubt other leguminous plants, it is stated to infest chicory, potatoes, and beet.

C. monogyna infests vines and some other plants; and *C. corymbosa* not only develops on lucerne but on various other leguminous plants.

PREVENTION AND REMEDY.

1. As it is so harmful when once established it is very important that dodder should not be allowed to obtain a footing on clean farms. This is undoubtedly only rendered certain by taking great pains that no seed is sown in which there is any trace of dodder. Bearing this in mind the purchaser should only deal with reliable firms, and should always insist, among other things, on a guarantee that all his seed is absolutely free from dodder.

2. If the purchaser is not satisfied as to the purity of any seeds he may have purchased an excellent plan is to sift clover and lucerne seeds, using a sieve of twenty meshes to the inch. Although the seeds of Large American Dodder are not removable in this manner, those of other dodders are separated with comparative ease. According to Nobbe's experiments, however, this method is not always entirely satisfactory owing to variations in the size of the clover and dodder seeds. In the case of white clover, for instance, the seeds may approximate in size to those of dodder. To make a cheap, serviceable sieve for the purpose the *American Agriculturist* lately* recommended the construction of a light wooden frame about 12 inches square and 3 inches deep, over the bottom of which a 20-mesh wire screen (made of No. 32 English gauge, round wire) should be tacked. In this one-fourth to one-half a pound of seed may be placed at a time and vigorously shaken for half a minute. A man should be able to deal with from 5 to 10 bus. per day. It may be remarked that where much seed is to be dealt with a larger sieve would be more useful.

3. In the case of all seeds the purchaser will be well-advised to consider the question of submitting samples to some authority for expert examination and approval.

* Ap. 28th, 1906.

4. Where dodder is found infesting a crop, however small the patch, steps should at once be taken to destroy it. This may best be done by digging up the infested plants and burning the whole, *in situ*, by covering the area 6-9 inches thick with long chaff, sprinkling it with paraffin, and then firing it. It is wise not to remove the infested plants for burning, as small pieces left on the field or dropped in fresh places may only serve to spread the infection. It is better to lose completely a small area of the crop by burning than to take risks and possibly have a much more serious infestation another year, especially since dodder seed may lie dormant in the soil for five or six years.

5. An infested field should not be allowed for a few years to carry a clover, lucerne or other leguminous crop.

6. Thaer recommends that the infested spot be surrounded by a small trench at a suitable distance from the outermost threads of dodder, the soil removed from the trench being thrown on the infested spot. This method, or burning with straw, he considers to be better than the employment of corrosive substances, sulphate of iron, large quantities of super-phosphate, or the refuse liquor from the manufacture of sulphate of ammonia, all of which work certain destruction to dodder. Such substances, however, ruin the soil for one or more years after use.

7. Tearing out the dodder with a rake is to be condemned, as this only serves to spread the evil.

8. Infested clover or lucerne should not be fed to stock, as the seeds may pass through the alimentary canal unaffected, and Frank mentions a case in which a field was actually infected by means of manure from young cattle, which had been fed on rape and linseed cake containing dodder seed whose germinating capacity had not been destroyed.

9. Frank suggests that substances which will smother the dodder may be effectually employed, such as a layer three inches deep of chaff, tan or gypsum, covered with an inch or so of fine soil and saturated with liquid manure or sprinkled with powdered quicklime in winter. The clover will generally break through such coverings but the dodder will be unable to do so.

10. In cases where the infestation is very extensive, covering the larger part of the crop, it is perhaps better to plough the whole under before seeds are formed.

11. In the *Comptes rendus de l'Académie des Sciences*, M. Garrigou called attention in 1904 to the value of calcium sulphide as a means of combating dodder and other parasites. In this connection he says "One may, with this parasiticide, cause the dodder completely to disappear in two days. A few hours after it has been sprinkled with calcium sulphide the dodder commences to blacken and wither, and, forty-eight hours afterwards, above all if the weather has been somewhat damp, it is completely destroyed." M. Garrigou's experiments show that this substance is very clearly superior to sulphate of iron.

12. Above all *good cultivation* in the widest sense should prevail, and all fields, hedges and ditches should be kept clean and free from weeds.

DODDER IN OTHER COUNTRIES.

United States.—In the United States of America dodder is considered a most troublesome pest, and clover and lucerne seed appear to be very frequently impure from this cause. According to a circular issued by the United States Department of Agriculture in May, 1906, 521 samples of the seed of red clover were obtained in the open market and examined. No less than 116 samples (or over 22 per cent) were found to contain the seed of dodder. In the seed exported to this country, however, dodder is hardly known.

South Africa.—Dodder also prevails in the South African Colonies, and according to an article in the *Transvaal Agricultural Journal* for April, 1906, the pest is gradually spreading in the Transvaal, owing to the persistence of the farmers in using poorly-cleaned seed.

France.—So great is the loss due to dodder in certain parts of France, says M. Marre, that he dare not attempt to estimate it, for fear he should be charged with exaggeration. The excessive development of the pest in 1904 led to the promulgation of regulations for its destruction.*

Germany.—In Germany dodder causes much trouble; and Thaer, writing in 1905, says that owing to dodder it is almost impossible to grow red clover and French lucerne in some districts of Germany. In the same way, he adds, a great part

* See *Journal*, March, 1906, p. 742.

of the lower districts of *Hungary* are prevented from growing lucerne, which formerly thrived there excellently.

Russia.—According to a report of trials carried out by the Agricultural Department of Leeds University the black seeds of European dodder are frequently found in samples of Russian red clover seed.

Chile.—Samples of clover seeds from this country frequently contain a species of dodder.

Canada.—Like that exported from the United States clover seeds from Canada rarely contain dodder.

New Zealand.—Of late years New Zealand has been exporting to Great Britain some particularly fine samples of clover seed, clean and of the best quality. It appears to be generally free from dodder.

Italy.—According to an article in *L'Agricoltura Moderna* for February 11th, 1906, dodder is very prevalent in Italy, and many samples of clover examined at the Royal Agricultural Experiment Station are found to contain the pest. The presence of even a few seeds per kilogram (2·2 lb.) is sufficient to reduce the commercial value of clover seeds, and yet in not a few cases the number of dodder seeds is very great; 600 to 800 seeds per kilogram are frequently present, and even 3,000 have been found.

It may perhaps be stated generally that clover seeds are imported into Great Britain from nearly all parts of the world, particularly Germany, France, Austria, Russia, Chile, the United States and Canada. With the exception of the seed from the United States and Canada nearly all these contain more or less dodder, but it is hardly known in the two last named. English-grown seed also rarely contains dodder. Lucerne is chiefly imported from France and the United States, but in much larger quantities from the former. The plant, too, from French seed is altogether superior to the American. Lucerne from these countries hardly ever contains dodder.

Description of Plates.—Pl. I.—(1) *C. trifolii* on Red Clover (*Trifolium pratense*); (2) flower; (3) section of calyx with pistil; (4) corolla laid open.

Pl. II.—(1) *C. epilinum* on Flax (*Linum usitatissimum*); (2), (3) and (4) as in Pl. I.

FORESTRY IN THE EXHIBITION AT
NÜRNBERG.

During the present summer and autumn a most interesting exhibition of Bavarian industries has been held at Nürnberg, and in a country possessing six and a half million acres of forest (nearly one-third of the total land area), it was only natural to expect that Forestry would occupy an important section. In point of fact the forestal display, both in its industrial and educational aspects, is regarded as the finest that has ever been attempted. A few notes on certain special points may not be without interest to English readers.

Of the $6\frac{1}{2}$ million acres of Bavarian forest land, the State owns about $2\frac{1}{2}$ millions, private individuals about 3 millions, while villages, towns, and endowed institutions possess about 1 million.

Although Bavaria possesses such a wealth of wood, there are few countries where more attention is given to methods of preservation by means of impregnation. In Great Britain impregnation by creosote is by far the commonest practice, whereas in Bavaria, and in Germany generally, a mixture of creosote and chloride of zinc is most commonly employed, next follows chloride of zinc alone, and then comes creosote. The comparatively subordinate position occupied by creosote in Germany is not due to lack of appreciation of its merits, but is entirely a question of expense. In this country, with abundance of coal, creosote, a bye-product, is cheap; in Germany, and especially in Bavaria, where coal is relatively scarce, creosote is dear, and more attention is given to other impregnating substances.

The different systems or methods of impregnation are classified as follows:—

Impregnation by Ascent, where posts or poles in a green state are set with their lower ends in a tank of the solution. As the sap of the wood is withdrawn from the top by natural evaporation, the solution enters below and rises in the cells and vessels, and in a short time (depending on the kind of wood) will appear at the upper surface.

Impregnation by Imbibition takes place where wood is

thoroughly air-dried, and is then immersed in the solution. The water of imbibition, which is in the substance of the cell walls, is expelled and replaced by the solution.

Impregnation by Filtration, where the solution is stored in a tank at a higher level than the stem to be impregnated, to which it is led by a pipe which is closely fitted into a hole in the wood. In this case the solution is under pressure, and is thus forced into the wood.

Impregnation by Injection, where the wood is first artificially dried and is then placed in a steel chamber, from which air may be pumped, and into which the solution is introduced under a pressure of several atmospheres. This is the method usually adopted on a large scale in this country.

As is well known, different species of wood absorb fluids very differently, the least suitable for impregnation being those with a well-marked duramen. The difficulty in forcing fluids into such wood is due to the fact that their vessels are packed full of a cellular growth (*thyloses*), as may readily be seen through a microscope of moderate power.

As was to be expected in a national exhibition in the country in which Hartig laboured for many years, and where Tubeuf now holds the chief professorship of Forest Botany, the diseases of wood, living and dead, are illustrated by a wealth of material never before equalled. Perhaps the most interesting object in this sub-section is the model of a dry-rot chamber, the original being at Bernau on the Lake of Chiem in the Bavarian Highlands, some two hours by rail from Munich. The quality of timber is tested in many ways, by resistance to pressure, resistance to tension, specific gravity, &c. But for many purposes the important thing to determine is resistance to decay, and Tubeuf has hit upon a novel and effective way of applying this test in a reliable and fairly rapid manner. For this purpose he has had a wooden hut erected in a peat bog, thus ensuring that it shall always be fairly moist, and into this house he has introduced a supply of old wood which is full of the dry-rot fungus. In order to test the power of resistance to decay of any species of wood, or of wood treated by any special preservative method, he places blocks of a given weight within reach of the fungus, and in a few months, or a year or two at

most, definite information as to the rate of destruction can be obtained.

A number of cross-sections exhibit the inexplicable condition of things that growth is more rapid on the underside than on the upper side of the branch of a conifer, whereas in the branch of a dicotyledon the opposite is the case. This may be seen by cutting off horizontal branches of the two classes of trees named. In the case of the conifer, the pith will be found to be nearer the upper than the lower side of the section, while in the dicotyledon the shortest radius is on the under side. The horizontally disposed roots of trees (the spruce is a good example) also show marked eccentric growth, but in their case the character of the eccentricity is always the same, the greatest growth, and therefore the longest radius, being on the upper side. It is evident that the upper side of a root is subjected to less pressure from the soil than the lower side, and as the cambium makes most wood where the pressure is least, the greatest growth is found in a root precisely where it is to be expected. But the variable condition of things in the branches of conifers and dicotyledons has always been a puzzle to botanists, and no satisfactory explanation is yet available. Nor is it quite easy to say why, in a tree grown on a steep hillside, greater growth should be shown on the side away from the hill.

A fine series of young trees has been prepared to illustrate the fact that most of the roots of forest trees live in intimate association with delicate fungus mycelia (*mycorhiza*). This relationship has not been fully worked out, but it is evident that it is of the same character as the symbiosis that exists between the roots of leguminous farm and garden crops and bacteria. Sometimes the mycelia work their way between the cells of the epidermis and cortex (*e.g.*, Scots pine, spruce, beech, oak, birch), and roots so affected are called *ectotropic mycorhiza*. In other cases the fungus strands actually penetrate the cells of the root (*endotropic mycorhiza*), examples of which are *Thuja occidentalis* and Yew.

In Bavaria, as in this country, oak bark has experienced a great drop in price during the past twenty years, the price per cwt. having fallen from 4s. 9d. in 1885 to 1s. 9d. in 1905. Con-

currently with this decrease in value, the returns from coppice woods have steadily declined, being 13s. 9d. per acre in 1885 and 8s. in 1905. But during the same period the returns from high forest have shown a satisfactory increase, having risen from 9s. per acre in the former year to 11s. 9d. in the latter. The cause of the fall in price of home-grown bark is the large increase in the importation of tanning materials, notably quebracho wood, specimens of which, and of the extract, were on view.

A number of interesting cross-sections were shown to illustrate the great increase in growth that results from heavily thinning a wood of oak or beech a few years before the final felling (*Lichtungszuwachs*). On the section a zone of a certain colour (e.g. red) represents the growth made by the tree, during say, ten years, before being isolated, while outside this the timber formed since the wood was thinned may be artificially stained green. The annual increment due to the admission of light is usually very great, and is often as much as 20 per cent., that is to say, a tree of 30 cubic feet may, in three years, have attained to about 50 cubic feet.

A number of cones formed of sections, two inches thick, taken every meter (3·3 feet) along an average stem, are shown illustrative of the yield of different species under different conditions. Thus, a beech wood 131 years old in Spessart has an average height of 115 feet, and carries 7,835 cubic feet per acre, quarter girth measure. An average oak from a forest in Spessart (over 200 years old) is shown in section, the height being 119 feet, and the volume per acre, quarter girth measure, 10,325 cubic feet. A spruce wood, 60 years old, in the Bayrischer Wald is similarly represented, the average height being 86 feet, and the contents per acre 5,820 cubic feet, quarter girth measure.

The export and import timber trade for the whole German Empire is represented graphically, and shows that whereas in 1880 the imports amounted to less than two million tons, valued at less than four million pounds, in 1904 they exceeded five million tons, valued at nearly twelve million pounds sterling. During the same period the export in timber fell from 830,000 tons, valued at a little over two million pounds to 323,000 tons of a value slightly exceeding one million pounds. Thus it is

seen that, even with its gigantic forest wealth, Germany's timber imports greatly exceed the exports.

An interesting section of the Exhibition is concerned with the display of products chemically prepared from wood. In 1889 it was discovered that the cellulose prepared from spruce timber could be made to furnish an excellent artificial silk, not so elastic and strong as the real article, but superior to it in lustre. The annual production is now estimated at over two million pounds weight, valued at 15s. per pound. It is now largely used in upholstery and for making ties and other articles of apparel.

More recently artificial horse-hair has been produced from the same source.

Yarn from wood is now an important article of commerce. It is found to dye and wash well, and to be very durable. It is, to some extent, replacing jute, cotton, and linen.

By the action of alkalies, oxalic acid is now largely prepared from sawdust, 100 lb. of the latter giving about 80 lb. of the acid.

Acetic acid has long been distilled from wood, the firm of Lanfach in Spessart, who are exhibitors, consuming annually not much short of a million cubic feet of beech timber in this way. It is estimated that in the year 1900 about three-and-a-half million cubic feet of wood were distilled in Germany for the production of four million pounds weight of acetic acid, most of which was used in the production of artificial indigo, though some went to make table vinegar.

In the production of acetic acid, wood is placed in a retort and heated to a temperature between 536 deg. F. and 608 deg. F. It is found that wood treated in this way yields about 24 per cent. of charcoal and 50—54 per cent. of liquids, while 22—24 per cent. goes off as gas. The liquid portion by further treatment yields 6—10 per cent. of tar, 3—10 per cent. of wood spirit, and $5\frac{1}{2}$ to $6\frac{1}{2}$ per cent. of acetic acid.

Doubtless the most important substance produced by the chemical treatment of wood is cellulose, for the production of a ton of which some 230 cubic feet of timber are required.

In Lower Bavaria (Niederbayern) private forests cover an area of some 650,000 acres, and constitute 79 per cent. of the total wooded surface. In the beginning of last century there

was a strong movement on foot in this district to split up and apportion communal forests amongst those who had rights over them, with the result that the present owners, in some cases, possess a piece of woodland only a few yards wide, and as little as a quarter acre in extent. Naturally, the management of these woodlands leaves much to be desired, and the State in 1900 appointed six forest experts, with ten assistants, whose chief business it should be to effect an improvement in these private woods. State nurseries (covering 120 acres) for the supply of plants of the best quality at cost price have been established in many places, the number of young trees distributed last season being $18\frac{1}{2}$ millions.

AGRICULTURAL RETURNS OF 1906.

The preliminary statement of the acreage and live stock returns issued by the Board on the 27th ult. shows that the total acreage under crops and grass in Great Britain amounted to 32,266,790 acres in 1906, this figure representing a decline of 20,042 acres from the area so returned in 1905. The changes in the extent of arable and pasture land respectively, and in the chief categories of crops, may be summarised as follows :—

Crops.	1906.	1905.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Cereal Crops	7,057,558	7,054,232	+ 3,326	+ 0.0
Other Crops	3,209,200	3,205,275	+ 3,925	+ 0.1
Clover and Rotation Grasses	4,440,746	4,477,518	- 36,772	- 0.8
Bare Fallow	314,552	349,313	- 34,761	- 10.0
Total Arable	15,022,056	15,086,338	- 64,282	- 0.4
Permanent Pasture	17,244,734	17,200,494	+ 44,240	+ 0.3
Total	32,266,790	32,286,832	- 20,042	- 0.1

The returns this year present no very marked features. There is a further recovery of slightly over 3000 acres in the area under cereal crops, which however does not quite bring the surface up to the figure returned in 1903, a total of 7,061,000 acres. Other crops—excluding clover and rotation grasses—have also increased, and, proportionately, more than the cereals. The

clover and rotation grasses, on the other hand, shew a small decline of about 37,000 acres or less than 1 per cent; while the area of the bare fallow exhibits a satisfactory decrease of 10 per cent., and is the smallest figure returned in any year with the exception of 1900 and 1902. The decrease in the arable land of Great Britain amounts on the whole to 64,000 acres or less than one-half per cent., of which rather more than two-thirds or 44,000 acres have been laid down to permanent pasture.

Among the cereal crops wheat shows a small decrease of 41,000 acres or 2 per cent., following upon the large increase of 1905, but the area devoted to this crop is still about 120,000 acres greater than the average of the past five years. Barley, on the other hand, for the first time since 1900, shows an increase of 37,600 acres, or 2 per cent., which practically balances the decline in wheat, the area under barley, however, still showing the large reduction of nearly 90,000 acres as compared with 1904. Oats continue to show a decline, but only small, the loss being 8,000 acres.

The detailed figures regarding the corn crops are as follows :—

Crop.				1906.	1905.	Increase or Decrease.	
				Acres.	Acres.	Acres.	Per Cent.
Wheat	...	...	...	1,755,716	1,796,995	- 41,279	- 2'3
Barley	...	...	...	1,751,238	1,713,664	+ 37,574	+ 2'2
Oats	...	...	...	3,042,926	3,051,376	- 8,450	- 0'3
Rye	...	...	...	64,808	62,197	+ 2,611	+ 4'2
Beans	...	...	...	288,891	254,765	+ 34,126	+ 13'4
Peas	...	...	...	153,979	175,235	- 21,256	- 12'1

The most noticeable of the changes in the crops classed as cereals is the large increase in the area devoted to beans, and a corresponding decline in peas, the increase in the former crop being 34,000 acres or 13 per cent. and the decrease in the latter 21,000 acres or 12 per cent., and it is necessary to go back as far as 1892 to find an area as large as the 289,000 acres now devoted to the cultivation of beans, while the area under peas is the lowest ever recorded, the nearest approach to the present figure being the 155,000 acres returned in 1901.

Among other crops potatoes have lost the area added last

year, and the decrease of 43,000 acres or 7 per cent. reduces the area to very little over the figure for 1903, the large area devoted to the growth of potatoes last year and the low prices prevailing, no doubt contributing to this result.

The green and other crops may be summarised as follows :—

Crop.	1906.	1905.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Potatoes	565,921	608,473	-42,552	-7'0
Turnips and Swedes	1,590,920	1,589,273	+ 1,647	+0'1
Mangold	431,458	404,123	+27,335	+6'8
Cabbage and Kohl Rabi	88,082	85,345	+ 2,737	+3'2
Rape	93,824	93,881	- 57	-0'1
Veiches or Tares	142,047	136,429	+ 5,618	+4'1
Lucerne	55,734	53,400	+ 2,334	+4'4
Hops	46,722	48,967	- 2,245	-4'6
Small Fruit	80,226	78,825	+ 1,401	+1'8
Other Crops	114,266	106,559	+ 7,707	+7'2

Turnips and swedes are practically stationary, the area being for the second year below 1,600,000 acres, while mangolds show an addition of 27,000 acres or nearly 7 per cent, the area now under this crop only having been once before exceeded, in 1902, when the acreage was exactly 10,000 acres more than the present figure. All other crops with the exception of rape and hops have been extended, the decrease in hops amounting to nearly 5 per cent., and bringing the area now devoted to hop cultivation to the lowest on record.

The figures relating to temporary and permanent grass are shown in the next table :—

Crop.	1906.	1905.	Increase or Decrease.	
	Acres.	Acres.	Acres.	Per Cent.
Clover and Rotation Grass (for hay)	2,191,587	2,189,286	+ 2,301	+0'1
Ditto (not for hay)	2,249,159	2,288,232	- 39,073	-1'7
Total	4,440,746	4,477,518	-36,772	-0'8
Permanent Grass (for hay)	4,785,613	4,688,520	+97,093	+2'1
Ditto (not for hay)	12,459,121	12,511,974	-52,853	-0'4
Total	17,244,734	17,200,494	+44,240	+0'3

The area intended for hay—whether from rotation or per-

manent grass—shows an increase of nearly 100,000 acres, the increase being for the most part in permanent grass, the clover hay showing only a small addition of some 2,000 acres. Of the area for grazing, both categories show a decline, that in the rotation grass being relatively greater than that in the permanent grass.

Among the live stock, cattle and sheep show an increase, while horses and swine exhibit a decline. From the subjoined table it will be seen that agricultural horses and unbroken horses under one year have decreased, while unbroken horses, one year old and above, have increased by nearly 5,000. The total decrease amounts to nearly 4,000 horses, and this is the first year since 1902 that a decline has had to be noted in this class :—

Horses.	1906.	1905.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Horses used for Agricultural Purposes	1,116,505	1,122,419	- 5,914	- 0.5
Unbroken Horses (one year and above)	315,235	310,333	+ 4,902	+ 1.6
Ditto (under one year) ...	136,941	139,681	- 2,740	- 2.0
Total	1,568,681	1,572,433	- 3,752	- 0.2

The increase of 23,836 brings the number of cattle to the highest total ever recorded, and for the first time gives the herds of Great Britain an aggregate of over 7,000,000. There is,

Cattle.	1906.	1905.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Cows and Heifers in Milk or in Calf	2,738,411	2,707,392	+ 31,019	+ 1.1
Other Cattle (two years and above)	1,426,754	1,415,317	+ 11,437	+ 0.8
Ditto (one year and under two)	1,494,795	1,471,070	+ 23,725	+ 1.6
Ditto (under one year) ...	1,350,896	1,393,241	- 42,345	- 3.0
Total	7,010,856	6,987,020	+ 23,836	+ 0.3

however, a decrease of 42,000 or 3 per cent. to be noted in cattle under one year old. All other classes show an

increase, and the number of cows and heifers is again the highest on record.

The total number of sheep again shows an increase over 1905, which was the first year since 1899 in which an increase had to be noted. The addition is absolutely and relatively greatest in ewes kept for breeding, the number of which now stands at over 10,000,000, a total which has not been before recorded since 1901. The decrease in other sheep, one year old and above, reaches nearly 49,000, or slightly under 1 per cent., but this deficiency is more than made up by the increase of 86,000 in lambs.

Sheep.	1906.	1905.	Increase or Decrease.	
	Number.	Number.	Number.	Per Cent.
Ewes kept for Breeding ...	10,061,104	9,935,766	+125,338	+ 1'3
Other Sheep (one year and above) ...	5,098,876	5,147,517	- 48,641	- 0'9
Ditto (under one year) ...	10,260,380	10,173,913	+ 86,467	+ 0'8
Total ...	25,420,360	25,257,196	+163,164	+ 0'6

Swine—a very fluctuating item—show a total decrease of over 100,000, or a little more than 4 per cent. Breeding sows, however, are slightly more numerous than in 1905, the numbers being 336,322 and 335,008 respectively, the deficit being wholly in other pigs, where a loss of nearly 103,000 is recorded, or 5 per cent.

AGRICULTURAL IMPORTS OF THE CEREAL YEAR.

The close of the period known as the cereal year (September 1st to August 31st) affords an opportunity for considering the extent to which this country has been dependent on the Colonies and on foreign countries for grain to supplement the harvest of 1905.

Wheat, the largest of our agricultural imports, after being received in increasing quantities for five consecutive years, experienced a check in the year just ended. It was hardly to be expected that the very great extension in the receipts which

marked the year 1904-5 would be maintained, and the figures have in fact fallen to nearly the level of 1903-4. The fluctuations will be seen in the table on the next page, which show the extremely rapid advances made in recent years. Wheat-meal and flour, on the other hand, have rather shown a tendency to decrease, and the amount recorded in 1905-6, though greater than the extremely small import of the previous year, is still materially below the quantities purchased in the earlier years shown in the table.

Taking the wheat and wheat-flour together and expressing the flour in its approximate weight as grain, the imports in 1905-6 represent 26,741,000 qrs. (of 480 lb.) of wheat, compared with 28,056,000 qrs. in 1904-5 and 27,927,000 qrs. in 1903-4. The estimated quantity of this grain obtained in the United Kingdom from the harvest of 1905 was 7,542,000 qrs., whereas the poorer harvests of the two preceding years only yielded 4,740,000 qrs. and 6,136,000 qrs. respectively. If, therefore, we take the wheat and wheat-flour available both from home and foreign sources during these three years, exclusive of stocks carried over, we find that the aggregate quantity recorded in 1903-4 was 34,063,000 qrs., in 1904-5 32,796,000 qrs., and in 1905-6 34,283,000 qrs.

With regard to the countries contributing to the supply, the receipts from each of the principal sources are given in the following table.

Country of Export.	In Thousands of Cwt.			
	1905-6.	1904-5.	1903-4.	1902-3.
India	11,743	29,083	23,144	11,908
Russia	18,377	28,823	19,331	13,721
Argentina	22,890	24,085	17,490	11,856
United States	17,917	4,558	12,897	32,035
Canada	11,177	3,547	8,355	11,471
Australia	7,488	12,758	6,322	79

Perhaps the most noticeable feature is the recovery shown in the United States trade. After occupying for many years the position of principal exporter to this country it has now for three successive years been surpassed by several other ex-

porting countries, but, as will be seen, the receipts from this source were much higher in 1905-6 than in the two earlier years, amounting to 17,917,000 cwt. The largest exporter however to the United Kingdom was Argentina, whence we received 22,890,200 cwt., compared with 24,085,000 cwt. in 1904-5. Russia occupied the second place with an aggregate very much below that of the previous year, while India only sent 11,742,722 cwt., compared with 29,083,000 cwt. in 1904-5. The exports from Canada were almost equal to those of 1902-3, which represents the maximum quantity yet exported in any one year from the Dominion. Australia accounted for 7,487,800 cwt.

The figures for the principal cereals in each of the past ten harvest years are given below :—

Year.	In Millions of Cwt.				
	Wheat.	Wheat-flour.	Barley.	Oats.	Maize.
1905-1906	94'6	14'4	20'3	16'0	47'1
1904-1905	105'1	10'9	21'0	17'2	42'3
1903-1904	93'1	19'1	31'9	15'2	47'6
1902-1903	85'1	19'2	25'7	16'6	41'6
1901-1902	74'7	19'1	23'1	16'7	47'2
1900-1901	71'2	23'3	18'7	22'1	55'8
1899-1900	65'0	21'6	15'2	19'8	57'7
1898-1899	67'0	22'9	22'9	14'9	57'5
1897-1898	66'4	20'0	20'3	15'4	55'6
1896-1897	65'0	20'0	21'7	18'4	59'7

The increase in the receipts of wheat flour was due to a revival in the trade with the United States and Canada, which together sent us 7,374,000 cwt., compared with 3,044,000 cwt. last year.

In the case of barley the imports were approximately the same as those of 1904-5, but a decline is noticeable in the case of oats. A feature in the trade in oats has been the growth in the imports from the United States, accompanied by a decline in Russian oats. Maize came chiefly from the United States and Argentina, only small quantities being received from Russia and Roumania, both of which were formerly important sources of supply.

The table which is given on the next page shows the imports in the twelve months under review of the other principal

agricultural commodities. The receipts of fresh beef, including the estimated weight represented by the arrival of live cattle, amounted to 9,262,000 cwt., as compared with 8,471,000 cwt. received in 1904-5. Live sheep were again received in fewer numbers, but the aggregate imports of fresh mutton, both dead and on the hoof, amounted to 4,289,000 cwt., compared with

Articles.	1st Sept., 1905, to 31st Aug., 1906.		1st Sept., 1904, to 31st Aug., 1905.	
	Quantities.	Values.	Quantities.	Values.
Horses No.	17,910	£ 504,618	12,813	£ 350,276
Cattle "	573,934	9,920,552	549,347	9,451,396
Sheep and Lambs "	108,688	164,298	292,565	443,427
Bacon cwt.	5,562,759	14,144,785	5,599,131	12,962,202
Hams "	1,329,544	3,397,653	1,332,706	3,177,261
Beef:				
Salted "	157,105	215,551	144,651	199,440
Fresh "	5,529,174	9,661,170	4,895,299	8,618,313
Mutton, fresh "	4,229,509	7,862,478	3,661,813	7,166,544
Pork:				
Salted (not Hams) "	199,013	255,981	232,067	281,757
Fresh "	486,815	1,121,429	555,351	1,274,223
Meat unenumerated:				
Salted or fresh "	678,995	1,001,084	665,819	1,214,213
Preserved other- wise than by salting "	721,959	2,344,980	775,224	2,470,704
Rabbits "	703,470	884,864	647,863	860,451
Corn:				
Wheat "	94,558,222	33,951,680	105,125,030	37,846,288
Wheat Meal and Flour "	14,432,900	7,119,597	10,882,143	5,478,331
Barley "	20,313,500	5,799,830	21,002,400	5,692,495
Oats "	15,997,463	4,667,825	17,211,000	4,714,450
Maize "	47,061,100	12,065,455	42,276,850	10,666,987
Butter "	4,325,788	23,260,020	4,105,799	21,065,270
Margarine "	1,099,434	2,708,801	1,058,669	2,721,585
Cheese "	2,685,856	7,466,302	2,492,036	6,016,248
Milk, condensed "	834,419	1,600,206	885,635	1,572,385
" and cream, fresh and preserved "	—	—	7,185	22,056
Eggs gt. hundreds	18,966,189	6,964,263	19,268,205	6,784,070
Fruit:				
Apples cwt.	2,894,022	1,899,952	3,566,462	1,838,884
Pears "	525,683	527,398	443,688	416,560
Hops "	193,417	659,209	243,731	1,574,638
Onions bushels	8,093,424	948,290	7,451,784	1,124,948
Potatoes cwt.	3,809,487	1,331,127	4,129,785	1,478,589
Tomatoes "	1,107,390	927,699	1,136,976	990,382
Tallow and Stearine "	1,940,880	2,695,989	1,743,329	2,220,331
Wool lb.	645,707,803	27,212,450	599,034,477	22,794,116
Hides, wet and dry cwt.	1,004,393	2,928,374	821,047	2,256,512
Lard "	2,157,541	4,351,093	1,945,388	3,534,364
Poultry and Game "	—	1,046,225	—	1,077,295
Vegetables (un- enumerated) "	—	397,649	—	447,234

3,822,000 cwt. in the preceding year, so that the supply of foreign mutton and lamb was on the whole considerably greater.

The total imports of bacon showed little variation, but while the receipts from Canada (1,230,000 cwt.) increased, there was a falling off in the exports from Denmark (1,443,000 cwt.), and also from the United States (2,789,000 cwt.).

In 1904-5 a check in the imports of butter had to be recorded, but the decline has not been maintained, and the receipts last year amounted to 4,326,000 cwt., compared with 4,106,000 cwt. in 1904-5 and 4,361,000 cwt. in 1903-4. Denmark is by far the largest exporter, her total reaching 1,642,000 cwt., while Russia, the next largest foreign contributor, only sent 544,000 cwt. This figure was, however, very nearly equalled by the Colonies of Victoria, New South Wales, and Queensland, which together sent 526,000 cwt., while 305,000 cwt. was received from New Zealand and 241,000 cwt. from Canada. The Colonial contribution, therefore, aggregated 1,072,000 cwt. or 24 per cent. of the total supply compared with 1,088,000 cwt. in the previous year.

The Board of Agriculture and Fisheries have this year made a new departure by issuing a Report on the Crop Prospects in Great Britain. The first Report, issued on August 22nd, covered the three principal cereal crops—wheat, barley, and oats—as well as potatoes, roots, hay, fruit, and hops.

**Report on Crop
Prospects in
Great Britain.**

A further report will be issued this month.

The Report details the condition of the various crops in the "Agricultural Divisions" usually adopted for the purpose of the Agricultural Returns, and is preceded by the following general summary:—

Reports from the Crop Estimators of the Board on the condition and prospects of the principal crops indicate that all are likely to exceed the average. Harvest generally started somewhat later than last year. The supply of labour is, on the whole, sufficient, but some districts in the North of England and in Wales report a scarcity.

Wheat and barley appear in each division of Great Britain

to be over average, while oats are slightly over average in all divisions with the exception of the North and North-Western division of England and the East of Scotland. Potatoes may be reckoned as slightly over average, and the prospect for the root crops is favourable; mangolds generally promise better than turnips. The hay crop is reported as deficient in the Eastern, North-Eastern, South-Eastern, and East Midland counties, while the yield in the West Midland and South-Western counties will barely reach an average. In the North and North-Western counties, Wales, and Scotland, the crop is distinctly over average.

Fruit has varied a good deal: apples are plentiful, except in the North, but pears are very scarce. Bush fruits are mostly average or better; but stone fruit appears to be almost universally a failure.

Hops are unmistakably the worst crop of the year, and the yield generally will be very deficient.

Generally speaking, prospects for the western half of the country appear more promising than in the east.

Summarising the reports, and representing an average crop by 100, the appearance of the crops in August indicates a yield for Great Britain as a whole which may be represented by the following percentages:—Wheat, 105; barley, 104; oats, 102; potatoes, 101; roots, 105; hay, 101.

The World's Wheat Crop.—According to the estimate published by the Hungarian Minister of Agriculture on August 31st,

**Notes on
Crop Prospects
Abroad.**

the wheat crop of the world may be expected to reach 949 million metric centners or approximately 436 million quarters (of 480 lb.) as against 426 million quarters in 1905. The requirements of the wheat-importing countries are put at 152 million metric centners, and the surplus available for export from the different wheat-exporting countries at nearly 174 million metric centners.

On the same date a similar estimate was issued by *Beerbohm's Evening Corn Trade List*, which calculated the wheat crop of the world at 437,600,000 qrs. (of 480 lb.), as compared with 420,840,000 qrs. in 1905, and an average production of 407 million quarters in the four years 1902 to 1905.

Germany.—According to the Report of the German Imperial Statistical Bureau, the condition of the crops in the middle of August was as follows:—Winter wheat, 2·2; spring wheat, 2·3; winter rye, 2·6; spring rye, 2·3; barley, 2·3; oats, 2·1; and potatoes, 2·6. (1 = very good, 2 = good, 3 = medium (average), 4 = small, and 5 = very small.) In a large part of the Empire the weather was dry and favourable for harvest work, but in some parts there were frequent rains, which delayed the harvest and made work difficult. The condition of the potato crop is not so favourable as in the previous month. Early sorts are affected with disease, but later varieties look better.

According to a report in *Dornbusch* (September 4th), the Statistical Bureau have estimated the harvest yield of Germany as follows.—

Crop.	In Thousands of Tons.		
	1906.	1905.	1904.
Wheat	3,900	3,700	3,805
Rye	9,600	9,607	10,061
Oats	7,500	6,547	6,936
Barley	3,140	2 922	2,948

France.—A report was issued by the French Department of Agriculture on August 4th which indicated that the condition of the cereal crops on July 1st was not so good as at the time of the earlier report up to the 15th May. According to later newspaper reports, the harvest seems to have been gathered under favourable conditions and to be generally satisfactory.

Spain.—According to a report in *Dornbusch* (August 17th), the yield of cereals is officially described as phenomenal, wheat being expected to reach about 18 million quarters, or nearly 8 million more than last year, and the heaviest for many seasons.

Hungary.—According to the report of the Hungarian Minister of Agriculture for the middle of August, the condition of the crops has very much improved since the middle of July, and an unexpectedly good yield is now anticipated. The preliminary returns of the various crops are given as follows:—

Crop	Estimated Area to be Reaped.	Estimated Yield.	
		1906.	1905.
	Acres.	Cwts.	Cwts.
Wheat	8,734,000	101,728,000	84,358,000
Rye	2,764,000	27,090,000	27,037,000
Barley	2,580,000	28,579,000	24,972,000
Oats	2,540,000	24,797,000	22,282,000
Maize	5,727,000	80,883,000	47,008,000
Potatoes	1,397,000	113,295,000	90,093,000

Russia.—From a report dated August 22nd by H.M. Consul at Helsingfors, it appears that the grain crops in Finland have been satisfactory. Rye, barley, and oats have in most places yielded a crop above the average.

United States.—Preliminary returns received by the United States Department of Agriculture up to the beginning of August indicated a winter wheat crop of about 493,434,000 bushels, an average of 16·7 bushels per acre, as compared with 14·3 bushels last year and 12·4 bushels in 1904.

The September crop report showed that the average condition of spring wheat at harvest was 83·4, against 87·3 at the same period last year; maize was returned on September 1st at 90·2, compared with 88·1 on August 1st and 89·5 on September 1st last year; oats stood at 81·9, and barley at 89·4, compared with 90·3 and 87·8 on the same date in 1905.

Argentina.—The final estimates of the Ministry of Agriculture for the crop of 1905-6, as reported in the *River Plate Review* (August 10th), show that 14,018,000 acres were sown, of which 13,314,000 acres were harvested and a yield obtained of 3,672,000 tons. The estimates for the next crop have also been issued, and show that 14,820,000 acres of wheat and 7,410,000 acres of maize have been sown.

Uruguay.—According to the *River Plate Review* (July 13th), official returns put the harvest of wheat in Uruguay at 125,344 tons from an area of 712,500 acres.

Canada.—The High Commissioner for Canada has received by cable from the Department of the Interior the following statement as to the crops of wheat, oats, and barley which have been harvested in the three Western provinces of Canada, viz.,

Manitoba, Alberta, and Saskatchewan. It is estimated that the aggregate wheat yield for these three provinces will total 87 million bushels, being an average yield of 19 bushels per acre; that of oats 75 million bushels, an average of 41 bushels per acre; and that of barley 17 million bushels, an average of 31 bushels per acre.

South Australia.—The official figures for the wheat harvest of 1905-6 give a yield of 20,144,000 bushels from 1,757,000 acres, which is 8,121,000 bushels more than last year. The average yield was 11.78 bushels per acre.

New Zealand.—According to a supplement to the *New Zealand Gazette*, dated July 3rd, the area of wheat reaped in the harvest of 1905-6 was 222,000 acres, from which a yield at the rate of 30.60 bushels per acre was obtained, or a total out-turn of 6,799,000 bushels. Last year the yield was 9,124,000 bushels, and that of 1902-3 and of 1903-4 was in both cases between seven and eight million bushels, so that this year's crop is less than that of the three preceding years. The yield of oats, barley, and potatoes is also smaller.

The Norfolk Chamber of Agriculture have had under consideration the making of Farm Records in connection with the Valuation of Farm Covenants and Dilapidations, and they nominated a committee in July, 1905, to discuss the question with the Norfolk Tenant-Right Valuers' Association. The Committee state that their views as to the making of records of farms upon entry are in accord with those of Mr. R. Hunter Pringle, Assistant Commissioner to the Royal Commission on Agriculture, 1893, who in his report on the counties of Bedford, Huntingdon, and Northampton (C. 7842) refers to the necessity of providing some means by which the condition of a farm at the commencement of a tenancy may be ascertained for purposes of contrast with the condition at its termination. He observes:—

**Farm Records
in Norfolk.**

“The schedule would form a complete description of the farm. The condition of each field should be fully portrayed, due attention being paid to its previous history, treatment, and cropping. Classification on the basis of par value or average

condition should be introduced, and a special nomenclature prepared for the use of arbitrators throughout the country. At any time during the currency of a lease or tenancy it should be in the power of either party to have an intermediate or interim report drawn up by the district arbitrator or some duly appointed official. Such interim report should be after the similitude of the originating schedule, and so framed as to become a registered document of service and assistance to the official arbitrator when adjudicating upon claims for compensation at the end of the tenancy. Guided and instructed by the originating and concluding schedules, and further assisted by any interim reports which may have been obtained, the arbitrator could soon discover whether and to what extent during the currency of his tenancy the outgoing tenant had improved or deteriorated his holding.

"Compensation should be given to the tenant who has improved the condition of his farm, or to the landlord whose property has been deteriorated according to the evidence of the schedules.

"With respect to unexhausted manures, compensation to the outgoing tenant would form a separate and distinct part of the award, and would be governed by scales fixed and arranged from time to time by the boards of assessors in conjunction with the official arbitrator."

The Committee have accordingly prepared a draft form of Record, which it is suggested should give particulars, field by field, of the crops for the preceding three years, description of soil, area, cultivation, tilth, cleanliness, manurial condition, condition of farm roads, fences and ditches, depth and distance apart of drain, bore of tile, condition of outlets, and general effectiveness. It should also contain a general statement as to the condition of fences, ditches, dykes, and gates immediately anterior to the commencement of the tenancy; of the sums spent in previous years in artificial foods and manures; and of the straw or green crops sold off the premises.

The Norfolk Tenant Right Valuers' Association stated that there would be no difficulty in carrying out the suggestion, provided landlords and tenants agreed to instruct valuers in writing to make such a Record, but the same must be in the form of a

separate award. They differ from the Committee, however, in regard to the estimation of "par value" or average condition, and think that this cannot be defined in any other way than by taking each case on its own merits.

The question of the proper utilization of the surplus potato crop is one which has recently attracted a good deal of attention in Germany. It is estimated* that about

**Potato Drying
in Germany.**

860 million cwts. of potatoes are annually harvested in Germany, and of this crop about 240 millions are used for human consumption, 350 millions are fed to live stock, 102 millions are used for seed, and about 80 millions by various industries. The balance of 88 million cwts. is lost by rotting during storage. In years of exceptionally good crops very great difficulty is experienced in disposing of the surplus, as the alcohol and starch factories are unable to absorb any further quantities, and cannot be regarded as outlets for the excess production. New means of utilizing the potato crop have therefore been sought, and it seems to be thought that a satisfactory solution has been found in potato drying.

In 1903 the Association of Spirit Manufacturers in Germany offered several prizes, amounting to £150 in all, for potato-drying machines for large and small quantities, and there are now a number of systems on the market. In most of them the potatoes are cut up into pieces, and dried by means of hot air, ordinary coal or coke being used as heating material. The cost of an installation may vary from £500 to £6,800, and the cost of drying from 2d. to 6d. per cwt. The return obtained for raw potatoes treated in this way depends not only on the cost of drying, but also on their starch content: thus, if the cost of drying is put at between 4d. and 5d., and raw potatoes with 16 per cent. of starch are taken as worth 1s. per cwt., the value of the dried product would be 5s. 6d. per cwt. With a reduced charge for drying or an increased starch content the value would be increased.

The real value, however, of potato drying lies in the fact that it enables a product of the farm, which might otherwise be

* *Mitt. der Deut. Land. Gesell.*, June 23rd, 1906.

wasted or lost, to be used for feeding purposes. For instance, in the case of a farm on which 1,500 cwt. of maize is consumed annually, it is estimated that 1,500 cwt. of maize at 6s. per cwt. would cost £450. To produce 1,500 cwt. of dried potatoes about 6,000 cwt. of raw potatoes would be required; taking the cost of drying at 4d. per cwt. the outlay would be £100. In addition, about 100 cwt. of cotton seed meal would be required to bring the feeding value of the dried potatoes up to that of the maize; this at 8s. per cwt. would cost £40; leaving a difference of £310 as a return for potatoes, or about 1s. per cwt. It must be remembered that 20s. a ton is regarded as an average value for the inferior potatoes used for industrial purposes, so that the proposed method is thought to offer a means of utilizing the whole surplus product for feeding on the farm.

The most important source from which compounds of ammonia are obtained commercially is coal. When this is treated for the production of coal-gas or for the manufacture of coke used in iron smelting, an "ammoniacal liquor" results which forms the raw material for the manufacture of ammonium salts. The distillation of the bituminous shales used in the Scotch paraffin industry also yields a certain amount, and the ammonia produced in iron works where coal is used instead of coke is also collected.

Production of Sulphate of Ammonia.

According to a return included in the Report of the Chief Inspector of Alkali, &c., Works for 1905, the amount of sulphate of ammonia produced in the United Kingdom during the three past years has been as follows :—

	1905.	1904.	1903.
	Tons.	Tons.	Tons.
Gas works	155,957	150,208	149,489
Iron works	20,376	19,568	19,119
Shale works	46,344	42,486	37,353
Coke oven works	30,732	20,848	17,438
Producer gas and carbonising works (bone and coal)	15,705	12,880	10,265
	269,114	245,990	233,664

There has been a considerable increase in the total production

during the past ten years, the output in 1896 being 191,000 tons. The most important contributor is the gas industry, and here the production has steadily, though not very rapidly, increased, but the most notable development in England and Wales has been the rapid extension of the application of ammonia recovery to coke oven plants.

The increasing production has been accompanied by a growth in the export trade from 128,000 tons in 1896 to 150,000 tons in 1901 and 189,000 tons in 1905. The value of the exports in 1905 was £2,382,000. Spain, Japan, Germany and Java are the principal importers, and one of the noticeable features of last year's trade was the large purchases made for Japan, which took nearly 34,000 tons, compared with 15,000 tons in the preceding year and only 1,000 tons in 1901.

The price of this manure has been subject to very considerable variations. In 1894 the average value of the sulphate exported was about £13 8s. 5d. per ton, while in 1897 it had fallen to £7 19s. 5d. per ton. Since then the value has risen fairly steadily, the average for 1905 being about £12 12s. per ton.

Both straw and peat, in common with other cellulose substances, have the power of absorbing nitrogen, though in various degrees, and in some experiments carried

Value of Moss Litter.

out at the South Eastern Agricultural College the absorptive power of peat moss was found to be five times as great as that of the straw. The value of peat moss, in fact, depends upon the amount of liquid it can absorb more than upon any other property, but there is considerable difference in different samples. For instance, in three samples examined on behalf of the Cockle Park Demonstration Farm, Morpeth, it was found that one sample was capable of absorbing 11 times its own weight of water, while two other samples took up only 9·4 and 9·2 units of water respectively. The difference in the amount of water absorbed by these samples is of considerable importance, a ton of the better sample of litter being capable of absorbing as much water as $1\frac{1}{5}$ tons of the other samples. It is also important that moss litter should be easily broken up, as when it remains in lumps these are found in the dung unsaturated with liquid manure.

Comparison has also been made at Cockle Park of the effects of dung made from moss litter and from straw, produced by cattle under the same conditions. This manure was applied to two $\frac{1}{2}$ -acre plots on light soil in Back House Field for swedes in 1905, with the result that 12 tons of moss-litter dung gave $25\frac{7}{10}$ tons of swedes an acre, while 12 tons of straw dung gave $23\frac{1}{3}$ tons of swedes an acre. All through the season the swedes manured with the moss litter looked best.

Seedling trees were planted last spring on land manured with these kinds of dung. That made from moss litter gave the best results with quick-growing acacia seedlings, but by far the worst results with slow-growing pine seedlings.

Professor Gilchrist considers that the results indicate that moss-litter dung is quicker in its action than ordinary dung, and is likely to give its best results on a quick-growing crop. It is evidently important also that moss-litter dung should be in a moist state when applied to the soil, as if dry and friable when applied, it will tend to bring about a dry condition of the soil, especially in a dry spring. The test is being repeated on larger plots.

Experiments for the purpose of testing the effect of spraying charlock in corn have been carried out by the University College of North Wales, Bangor, for many years past, and they have almost without exception been successful. No experiments are now being made, but demonstrations are still given in the various districts of North Wales in order to induce farmers to undertake spraying, which is by far the most satisfactory and economical method of dealing with charlock.

Cost of Charlock Spraying.

It has been stated that charlock spraying would be much more common than it is but for the cost of the spraying machines. Very little consideration will show that this objection is not a serious one. Professor Winter points out that one machine, costing anything from £5 to £8, would be sufficient to spray all the charlock in at least three or four parishes. If a few farmers, therefore, combined to purchase, the cost to each would be very small, or if any enterprising man in a district were to purchase a machine for himself and spray the corn in

the district at so much an acre he would very soon recover the purchase money. On small farms a hand machine, which can be purchased for about 30s., will do all that is required. The bluestone and labour required in connection with spraying may cost from 4s. to 7s. an acre. The benefits derived undoubtedly more than counterbalance this outlay.

The experiments carried out during recent years have all been on the same plan, 3 per cent., 4 per cent., and 5 per cent. solutions of sulphate of copper having been used at the rate of fifty gallons per acre. In dry warm climates a 3 per cent. solution is usually sufficient, but in most parts of North Wales it has been found that a 5 per cent. solution gives the best results.

The Chambers of Agriculture, which are semi-official bodies constituted under a Prussian law of June 30th, 1894, exercise a very important influence on the agricultural life of Prussia. Broadly speaking, they may be said to assist and support the farmer in every possible way; they protect, develop and promote the interests of agriculture and forestry in all their branches, give advice to the Government, to landowners and to farmers on all agricultural and technical questions, supervise agricultural and co-operative banks, co-operative societies, associations of all kinds for the improvement of the farming industry, and issue market prices regularly. The members are elected by the provincial parliament for periods of six years, landowners, tenants and farmers being eligible for election; 115 members are elected, who choose among themselves a chairman and a board of eleven members who manage the business of the Chamber. The members do not receive salaries, but they receive 10s. per day for every day devoted to the work of the Chamber and their actual railway ticket outlay.

In the case of the Chamber of Agriculture of the Rhenish Province the permanent staff, which is paid, consists of one permanent general secretary, six higher officials, four purely technical officials, sixteen clerks, two stock-breeding inspectors, one poultry-breeding inspector, four viticultural teachers; besides these all the directors and masters of the thirty-one agricultural

winter schools are under the permanent and constant management and supervision of the Bonn Chamber of Agriculture.

An interesting account of the work of this Chamber is given in a Report* to the Foreign Office by Dr. Koenig, H.M. Consul at Dusseldorf, from which it appears that its yearly income is about £40,000. Of this sum £8,000 is an annual subsidy from the Government, another £8,000 is a contribution paid by the province. The Chamber spends £9,000 to £10,000 annually on its agricultural schools, £8,500 go to subsidise the breeding associations, £1,000 to pomology, viticulture and gardening, and £600 a year go towards the expense of publishing journals. The Chamber not only encourages agriculture directly, but does all in its power to exercise a political influence on the agricultural legislation of the province, and it may be said that there is no branch of agriculture which does not receive a helping hand from the Chamber and through it from the Government. As stated above, a large sum of money is devoted to subsidising associations for horse, cattle, pig, goat and poultry breeding. The cattle-breeding associations were referred to in an earlier number of this Journal (October, 1905, p. 406).

One interesting development promoted by the Chamber takes the form of butter-testing competitions.

The object of the tests, which take place in the autumn and spring, is to encourage the production of a more uniform class of butter. The province is divided into from four to six districts and tests are held twice yearly in certain places provided that twenty dairies undertake to send samples.

Each sample has to weigh five lbs. and must be supplied free, but no charge is made. The samples go towards meeting the cost of the competition. The dairy has to fill in a column of answers to questions regarding the manufacture and mode of production. The dairy's samples are represented by numbers and not by names, so that the judges do not know who has sent them in.

There are four classes: (a) sweet cream butter; (b) partially sour cream butter; (c) butter made from full or whole milk; (d) butter made from full or whole milk in part only.

Points are awarded as follows:—Taste (purity, salt), 25;

* *Foreign Office Reports, Misc. Series, No. 552.*

smell, 5 ; contents of water and milk (working), 10 ; appearance (colour, &c.), 5 ; consistency and hardness, 5 ; making a total of 50 points. Butter with 48 to 50 points is called and sampled as very fine, 45 to 47 points fine, 40 to 44 points good, 30 to 39 points second class, below 30 inferior.

At the close of the show or competition a criticism of the whole is published by the Chamber of Agriculture. All competitors receive a report of the competition and every competitor awarded 45 points three times or 48 points twice receives a diploma. Special prizes are given for particularly good exhibits. Full reports are published in the provincial agricultural papers.

The Chamber also encourages and controls mutual associations for seed growing, which have proved a great boon to small-holders who are unable to pay high prices to dealers for seed.

Fruit-farming is another branch in which the assistance of the Chamber of Agriculture has been a great success ; the Chamber endeavours to compel sellers of fruit trees to guarantee absolutely the variety and reliability of the article they sell. It has founded sixty-six fruiterers' associations and started a fruit-sellers' co-operative society at Bonn, with the result that fruit in the Rhenish province has improved in quality. The Chamber of Agriculture managed the exhibition of fruit and vegetables in Düsseldorf in 1904. During that year (spring to autumn) fortnightly shows were held for various varieties of produce in connection with fruit, vegetables and flowers. The exhibits made by the associations were particularly noteworthy ; at this international exhibition the Rhenish province won a very large number of medals and prizes.

The Chamber of Agriculture has at its disposal a State fund for supplying fruit trees at reduced prices and funds are also applied to help small holders to purchase trees. Assistance is given up to one-half the value of the trees ; one person cannot receive more than twelve trees. Application has to be made to the Chamber of Agriculture through some farmers' club or association. The club or association has to supervise the planting and to see that proper care is given to the trees. The Chamber of Agriculture reserves to itself the

decision as to the selection of the suitable varieties. The number of fruit trees thus planted through the Chamber of Agriculture last year amounted to 8,000. The number of grafts distributed came to over 30,000 in one year.

A great deal of educational and scientific work is also carried on by the Chamber. Regular courses of lectures are given to farmers by agricultural experts. The lectures are held in connection with excursions to neighbouring farms where the subject can be conveniently demonstrated. Books and pamphlets are also published. There are thirty-one agricultural schools under the direct supervision of the Chamber as well as a poultry and a dairy school. In the spring and summer special courses of lectures on various subjects are held which are very well attended.

In order to simplify the methods formerly used to ascertain the pure breeding of animals imported for breeding purposes, the United States Department of Agriculture has recommended to the Secretary of the Treasury that in all cases where a certified foreign book of record is affiliated with a certified American book of record, the certificate of the custodian of the latter, and no other, that animals are pure-bred, of a recognised breed, and duly registered in the books of record established for that breed, shall be accepted by the officers of the Customs as sufficient to entitle such animals to free entry. This provision is expected to facilitate the importation of live stock into America, and will permit importers of live stock registered abroad to communicate direct with American registered Associations. These Associations will register the pedigree of the animals which it is proposed to import, and the registration certificates of the Associations will be accepted at the ports of entry by the Customs authorities,

**Live Stock
Import Regula-
tions.—United
States.***

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Oct., 1904; Argentina, Jan., 1905; April, 1905, Oct., 1905, and June, 1906; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; and Transvaal, June, 1906.

and enable the animals to enter duty free. Where a foreign book of record is not affiliated to any American Association, it may, subject to certain formalities, be certified by the Secretary of Agriculture, and its certificates will in that case be accepted by the Customs.

The regulations of the United States Treasury of August 17th, 1904, re-issued August 24th, 1905, of which a summary was given in this *Journal* for October, 1904, have accordingly been revoked and superseded by new Regulations dated July 11th, 1906. It is now provided that no animal imported for breeding purposes shall be admitted free of duty unless the importer furnishes a certificate of record, in due form, showing that such animal is pure-bred and has been admitted to full registry in the book of record established for that breed, with an affidavit by the owner, agent, or importer, showing that such animal is identical with the one described in the certificate.

Unless the certificate of record is produced the animal shall be considered as dutiable, and under no circumstances will certificates be accepted from books of record other than those mentioned in a list attached to the Circular. The list can be seen on application at the offices of the Board.

In the case of the following breeds of cattle, the certificate of the American record society will be required, viz., Aberdeen-Angus, Ayrshire, Devon, Galloway, Guernsey, Hereford, Jersey, Red-Polled, Shorthorn and Sussex; while British certificates will be accepted from the Highland, Kerry and Dexter-Kerry, and Welsh Herdbook Societies.

In the case of the following classes of horses American certificates will be required:—Cleveland Bay, Clydesdale, Hackney, Saddle Horse, Shetland Pony, Shire, Suffolk, and Thoroughbred. No British certificates will be accepted in the case of horses.

The following breeds of sheep are covered by American Sheep Societies:—Cheviot, Cotswold, Dorset Horn, Hampshire Down, Leicester, Lincoln, Oxford Down, Shropshire, Southdown and Suffolk. British certificates will be required for the Kent or Romney Marsh, Wensleydale and Wensleydale blue-faced breeds.

The British breeds of pigs registered in America are the Berkshire, Cheshire, Hampshire, Tamworth, and Yorkshire. No British Pig Societies are included in the list.

By Section 11 of the Regulations of June 28th, 1905, issued under Ordinance No. 10 of 1898, it is provided that when cattle are imported into Ceylon a certificate must be obtained by the importer for each animal. This certificate will be issued by an officer appointed by the Government Agent of the Province. All cattle imported are required to be examined by the Government Veterinary Surgeon, and the importation of diseased and infected cattle is prohibited by the Customs Ordinance.

**Live Stock
Import Regula-
tions.—Ceylon.**

The regulations as to the examination and quarantine of cattle imported into Cape Colony, contained in Proclamation No. 75 of 1900,* have been repealed, and replaced by regulations (Proclamation No. 156 of 1906) bearing date 5th May, 1906. Under the new regulations all cattle, save those hereafter excepted, shall, upon arrival at any port in the Colony from any country oversea, be liable to be subjected by a Government veterinary surgeon to the tuberculin test before being allowed to land. It will, however, be within the discretion of the veterinary surgeon to accept the certificate of any duly qualified veterinary surgeon of the country from which such animals have been brought, supported by a record of temperature reactions, to the effect that such cattle were subjected to the tuberculin test immediately before being embarked, and had given no indication of the presence of tuberculosis.

**Live Stock
Import Regula-
tions.—Cape
Colony.***

In the absence of a satisfactory certificate, the cattle shall be quarantined, and shall be subjected by a Government veterinary surgeon to the tuberculin test. In the event of the test indicating the presence of tuberculosis, the animals shall be destroyed, but the flesh may be used for human consumption if the said officer gives a certificate to that effect.

These regulations do not apply to cattle imported solely for purposes of slaughter.

All expenses of inspection, quarantine, testing, destruction, and otherwise shall be borne by the owner of such cattle.

* *Journal*, February, 1905, p. 681.

The Board have been informed that the following remedy has proved very effective in cases of gapes in poultry. "A brick is placed on the fire until nearly red-hot. It is then taken out, put at the bottom of a large-sized pail, and a small quantity of ordinary carbolic oil poured on it. The chickens which require treatment should be previously placed in an old basket, which is placed on the mouth of the pail, but not touching the brick. The fumes from the oil rise and pass through the interstices of the basket and are kept from escaping too fast by a cloth which is thrown over the basket. The chicks are kept here until nearly suffocated, and then immediately placed in the open air."

**A Remedy for
Gapes
in Fowls.**

It will be seen that this remedy is a variation of the treatments with camphor, tobacco smoke, &c., all of which are intended to cause violent coughing for the purpose of ejecting the worms located in the trachea.

It is stated that the birds are unwell for a day or two, but that the treatment is so effective that only in a few cases has it to be repeated. The cost is trifling.

It will be understood, however, that it is only a local treatment for each individual case, and cannot be expected to eradicate the disease from the run, which should be attempted by a purification of the ground, either with gas-lime or by watering with a 1 per cent. solution of sulphuric acid. Fresh ground should be used if possible, and strict attention should be paid to cleanliness. An account of this disease is given in Leaflet 58 ("Internal Parasites of Poultry").

Gooseberry bushes are frequently infested with the gooseberry scale (*Lecanium ribis*), which also attacks the different species of currants, and has been taken on some other plants. The little brown cases which are found on the twigs here and there are the shelter cases, under cover of which the female scales lay their eggs. The following methods of getting rid of this pest may be recommended:—

**Gooseberry
Scale.**

1 Prune badly-infested trees and burn the prunings at once.

The twigs cut away must not be allowed to lie about on the ground, but must be burnt.

2. Spraying or sponging the plants with paraffin emulsion, made by boiling together $\frac{1}{2}$ lb. of soft soap and one gallon of soft water; remove this from the fire, and while still boiling add two gallons of paraffin. Then churn very thoroughly, till a butter-like mass is produced. The churning should be done with a force pump, as on the thoroughness of the mixing largely depends the efficiency of the material. For sponging down or spraying the bark, add nine times the quantity of water and mix well. For spraying the foliage more water should be added to prevent scorching. It is a good plan to rub the paraffin emulsion with a stiff brush into crevices and ragged bark, where the scales are often found under cover.

3. A mixture of soft soap and sulphur in hot water has also proved effective.

A repetition of the paraffin emulsion spray to the bark early in the following spring has been found serviceable.

The Board have received an inquiry for information as to the "Black Stripe" or Black Rot (*Macrosporium tomato*) of tomatoes.

"Black Stripe" of Tomatoes. Information regarding this disease will be found in the Text-Book of Plant Diseases, by Mr. George Masee, from which the following paragraphs are taken.

This disease appears to be present wherever the tomato is cultivated. The fruit is most frequently attacked, but the fungus is also often present on the stem and leaves. The fungus is a wound-parasite, and on the fruit most frequently effects an entrance through minute cracks round the style, or at the point of insertion of the stem, but may appear on any part of the fruit where a puncture of the skin large enough to admit of the entrance of the germ-tube of a spore is present. A dark-coloured mycelium forms in the tissues, and rapidly destroys the cells, consequently the area occupied by the fungus sinks a little below the general surface of the healthy part of the fruit. At a later stage the sunken surface of a diseased spot becomes covered with a delicate, velvety pile of a brownish or blackish-olive colour. Microscopic examination shows this pile to consist of closely

packed, dark coloured conidiophores, each bearing a dark, many-celled conidium at its tip.

Preventive Means.—Thorough spraying with potassium sulphide solution at frequent intervals. All diseased parts should be cleared away and burned, otherwise they continue to grow on shrivelled fruit, stems, and leaves. The use of stable manure is considered to favour the disease, and also causes the fruit to crack, thus rendering it susceptible to a high degree.

Fumigation by Hydrocyanic Acid Gas is recommended as a remedy for mussel scale (Leaflet No. 107), and also in the case

**Fumigation by
Hydrocyanic
Acid Gas.***

of young nursery stock for the prevention of Woolly Aphis and other pests. It is also a very useful means of clearing glass-houses of insect pests, mealy bug on vines, &c.

In leaflet No. 107 a treatment suitable for young fruit bushes or trees is described. The following instructions are more applicable to greenhouses, conservatories, &c. :—

The materials necessary for purposes of fumigation are :—(1) cyanide of potassium ; (2) sulphuric acid ; and (3) water.

The proportions in which these are used and the amount of space per unit of cyanide vary slightly as recommended by different workers, thus one recommends :—1 oz. of cyanide 98 per cent. purity to every 500 cubic feet of space ; another, 1 oz. of cyanide 98 per cent. purity to every 300 cubic feet of space ; and another, 1 oz. of cyanide 98 per cent. purity to every 200 cubic feet of space.

Strawson recommends the following as a standard :—Half as much again of sulphuric acid as cyanide, and of water $2\frac{1}{2}$ times more than the quantity of acid, thus :—Cyanide of potassium, 98 per cent., 1 oz., sulphuric acid $1\frac{1}{2}$ fluid oz., and water 4 oz.

The variation in the amount of cyanide depends to some extent on the character of the plants that are being treated. In the case of tender plants, 1 oz. of cyanide may serve for 500 cubic feet of space, while hardy plants may be treated with 1 oz. of cyanide to 200 cubic feet of space.

Method of Application.—The glass-house or other place which is to be treated must be rendered airtight.

* *Journal*, Vol. XII., p. 496, Nov., 1905.

The sulphuric acid should be poured very carefully into the water, which may be put in an earthenware dish. The cyanide of potassium, wrapped in blotting paper, should then be dropped into the now diluted sulphuric acid. The dish into which the cyanide is dropped must be so near the door that it can be reached by the outstretched arm of the operator, who should *immediately* shut the door and close up its chinks by paper previously prepared. Another method is for the operator to introduce the cyanide to the diluted sulphuric acid through a window in the room or conservatory, the cyanide being placed at the end of a long stick or rod, or being lowered into the acid by a string and pulley. The window must be closed immediately after the addition of the cyanide, so that the operator may escape the fumes. Strawson recommends the pouring of the diluted acid over the cyanide by arranging for the purpose a bottle, which can be tilted up, containing the proportion of acid.

It is of importance that the hydrocyanic gas fumes be distributed over the house, and to diffuse them Strawson suggests an arrangement of fans that could be worked from the outside by a string.

Fumigation should take place in the evening, or after night-fall, and not in strong sunlight. The temperature of the house should be from 50 degs. F. to 60 degs. F. The plants to be treated should be dry. The surface of the soil of the house should also be as dry as practicable. Experiment has shown that the eggs of the Woolly Aphis may remain unaffected, and therefore fumigation should be repeated in ten days.

Points to be Carefully Noted.—The work should be done by a careful and skilled operator.

The cyanide and its fumes are very poisonous and dangerous to human and other animal life.

The treated room or conservatory must be kept closed during fumigation from three-quarters of an hour to an hour, after which the room should be ventilated, the windows, &c., being opened from the *outside*, and no one should enter until an hour has elapsed. While opening the windows, &c., the operator should be careful not to inhale the escaping fumes.

It is safer not to fumigate when the plants are in bloom.

There are several species of gnats, but speaking generally all gnats have the following life-history. The eggs are laid by the females in water, and from these larvæ are hatched out, which are entirely aquatic in habit. These larvæ breathe air taken in by means of a small tube which projects from the hinder region of the body, and which is thrust above the surface of the water. On this mode of respiration is founded one of the measures described below for combating the gnats. When the larva is full grown it becomes a pupa, the pupal stage also occurring in the water. When this stage is completed the pupal skin bursts, and from it the adult emerges, and, after its wings and other external parts have dried and hardened, it flies off. The egg, larval and pupal stages all need water for their development, and water in some form is always the source of any case of infestation of gnats. The following are likely places for the breeding of the pests:—Open water butts; cisterns without covers; tanks of any kind without covers and containing water; open pieces of water from which water may be drawn for garden and conservatory; ditches; large and small puddles (for the larvæ can be bred to maturity in quite shallow water); pools.

If such breeding places be destroyed, and egg-laying is prevented, no adults can be formed.

Careful attention should, therefore, be paid to water barrels, butts, and exposed cisterns and tanks, which should be covered with boards. If the covering boards fold so that chinks are left, these chinks must be covered over to prevent the eggs reaching the water.

Puddles and similar pieces of water should be filled in with earth or other material, while ditches and other places that cannot be filled up should be well drained. Ponds or sheets of water should be examined, and if any larvæ are found, a bundle of rags should be dipped in paraffin and the paraffined rags drawn over the surface of the pond on a quiet day. The result will be that the surface of the water will be covered with a thin film of paraffin, and, the breathing tubes of the gnat-larvæ failing to pass through the paraffin, all the larvæ will be suffocated. This treatment should be repeated every week as long as the larvæ are found.

The indoor resting places of the adults, such as closets beside cisterns, rooms near tanks, &c., should be fumigated by burning fresh dry pyrethrum powder in them. The rooms before treatment must be rendered airtight and kept closed for an hour.

A great step forward in the progress of forestry in South Africa was taken last March when a School of Forestry was opened by the Government of Cape Colony for the scientific training of forest officers and for research in South African forestry.

**South African
School
of Forestry.**

Cape Colony has long been known as the most progressive colony in the Empire as far as forestry is concerned, and it has spent many hundreds of thousands of pounds on afforestation during the past twenty-five years.

Up to the present not half a dozen of the large Cape Forest Staff have received any but practical training in forestry, and those in charge have thus had to carry out much of the work that should have been done by their subordinates. As the forest estate of the Cape has increased so largely of late years and more scientific methods are being adopted in managing it, the necessity of a trained staff has become more and more pressing. The trained men at present in the service have been educated at Cooper's Hill and, latterly, at Yale, but only the favoured few could go to these places on the score of expense. Besides, the instruction given at these places had no particular bearing on South African conditions.

As the Governments of Natal, Transvaal, Rhodesia, and the Orange River Colony have also embarked on forestry on a more or less extensive scale, the Cape Government is relying on receiving a few students from them and possibly even from Australia, in view of the fact that the Cape School would be the only extra-tropical School of Forestry in the English-speaking world. For these reasons the Cape Government decided to open a Forest School in connection with the Science Departments of the South African College. There are at present thirteen students undergoing training, of whom one is from the Transvaal and one from the Orange River Colony. The staff of the school and the subjects they teach are as follows :—

D. E. Hutchins, F.R. Met. Soc., late Forest Service of India and School of Forests, Nancy, France ; Conservator of Forests ; Professor of Forestry and Lecturer in Forest Geography and History.

L. Peringuey, F.L.S., Lecturer in Forest Entomology.

G. A. Wilmot, Assistant Lecturer and Demonstrator in Forestry and Lecturer in Forest Management and Forest Law.

H. H. W. Pearson, M.A., F.L.S., Professor of Botany.

P. D. Hahn, Ph.D., M.A., Professor of Chemistry.

H. Payne, A.M.I.C.E., M.I.M.E., Professor of Engineering.

Andrew Young, M.A., B.Sc., Professor of Mineralogy and Geology.

W. S. Logeman, L.H.C., Professor of Modern Languages.

J. C. Beattie, D.Sc., F.R.S.E., Professor of Physics and Lecturer on Climatology and Meteorology.

Lawrence Crawford, M.A., D.Sc., F.R.S.E., Professor of Pure Mathematics.

The regular course in Forestry extends over a period of two years, preceded by a preliminary scientific course of one year specially arranged for those students who are not qualified to enter the regular course.

Tours of instruction in the indigenous forests of the Cape will be made on the conclusion of the course, and during the course practical work will be done in the artificial forests in the neighbourhood of Capetown.

Application for further information about the School should be made either to the Chief Conservator of Forests, Capetown, or to the Registrar, South African College, Capetown.

[*Transvaal Agricultural Journal*, July, 1906.]

The Board of Agriculture and Fisheries desire to draw attention to the occurrence on the larch of an insect, hitherto unrecorded in destructive abundance in this country. The insect in question (*Nematus Erichsonii*) is a species of saw-fly, the larva of which bears considerable superficial resemblance to the gooseberry caterpillar and to the caterpillar of the Pine Saw-fly. The larvæ are about

**Species of
Saw-Fly
Attacking
Larch Trees.**

three-quarters of an inch long, and possess 20 feet. They feed upon the leaves of the larch from about the middle of July till the end of August. At the present time, therefore, few larvæ are to be found, but trees that have been attacked can readily be distinguished by their more or less leafless condition, and amongst the moss, grass, and leaves underneath such trees the brown cylindrical cocoons will be discovered. Where this is the case, the surface-covering of the ground should be collected and burned.

So far, serious damage has only been reported from Cumberland, where, however, the health, if not the life, of an extensive larch plantation is in danger.

It is of the utmost importance that outbreaks should be discovered at an early stage, so that they may be suppressed while still of restricted extent.

The Board are preparing an illustrated account of the insect, which will be published in the October issue of their *Journal*.

Protection of Fruit Trees from Frost.—With reference to the notes which have been given in this *Journal** as to the protection

Miscellaneous Notes.

of fruit trees against frost, the United States Consul-General at Berlin states that in the opinion of the owner of a large seed farm near Berlin, who has experimented with various kinds of smudges, these smoking processes may be used by the private individual who seeks to protect his small garden against late frosts, but in large orchards and vineyards such means are not practicable, both because they are costly, particularly when tar or patent substances are used, and also because it is almost impossible to produce a uniform smoke cloud over a large surface sufficient to keep the cold away, especially when there is any wind.

A writer quoted in the *Queensland Agricultural Journal* considers that damp manure smothered with weeds makes the best smudge and is more effective than tar and other materials. Kerosene should be poured on the heaps. He recommends keeping the manure in old sacks, as it can then be moved about easily, and can be kept dry through rainy weather, so as to be in good condition for lighting when required.

* *Journal*, April, 1906, p. 57, and June, 1906, p. 184.

Horse-breeding in Japan.—With reference to the notice in this *Journal** on the subject of horse-breeding in Japan, H.M. Ambassador at Tokio (Sir C. M. MacDonald, G.C.M.G.) reports that a sum of £75,000 has been voted for the purpose of establishing a central bureau, and a number of Government stud-farms throughout the country. The new system, which was to supersede all existing arrangements for Government horse-breeding, was to come into force this year. Sir C. M. MacDonald is informed that the scheme provides for the eventual purchase of 1,500 stallions abroad.

Bacon for Germany.—H.M. Consul at Stettin (Mr. R. Bernal) states in his report for 1905, that no Irish bacon or hams are imported direct to Stettin, nor are any sold here as such. . . . A small quantity of (English) bacon is sold, the price being 2s. per lb. retail. American bacon is imported, and a market might be found for Irish bacon.

Importation of Fodder into Spain.—Mr. Keyser, H.M. Consul at Cadiz, remarks on the opportunity afforded by the prolonged drought in Spain for importers of hay and other food for horses and cattle in 1905. Some cargoes from France and Canada found ready sale. The hay from the United Kingdom was considered high in price. Possibly it was of too good quality, since farmers are accustomed to feed stock on straw and are unable to afford more expensive fodder. There is no hay made or used in Spain. Straw is universally used for all horses and cattle. What is really required, says Mr. Keyser, is the importation of some cheap food which will keep animals alive when there is a shortage of local fodder through drought. Such food should be sent in pressed trusses of a size and weight for convenient transport by rail or cart. The duty need be of no concern to the shippers, since it would be chargeable to the purchasers, who in times of drought can usually arrange that it be reduced or waived by the Government.

Sulphide of Calcium as an Insecticide.—In several of their leaflets dealing with insect and fungous pests of farm and garden crops, the Board have recommended the use of such remedial or preventive agents as carbon bisulphide, potassium sulphide (liver of sulphur), and flowers of sulphur. In this

* *Journal*, March, 1906, p. 760.

connection a note by M. L. George* is of interest, in that the employment of calcium sulphide is recommended for combating certain parasites. It has already been tried for several years as a protection for broad beans, peas, and haricot beans against certain predatory insects, and its use has been attended with good results when judiciously applied. Roses are very effectually protected when attacked by green flies or plant-lice by blowing the sulphide over the flowers, buds, and leaves. The green flies are destroyed in a few hours, the roses being quite unaffected. Its value in destroying dodder is referred to on p. 337.

Basic Slag Treated by Steam Pressure.—In 1903 a new form of basic slag was introduced in Germany, which, instead of being ground, had been exposed to a high steam pressure (8 to 9 atmospheres) for several hours. This has the effect of reducing the bulk of the slag treated to a fine powder, which can be sifted from the remainder, and is then ready for use. The solubility of the slag in citric acid should be increased by steaming, but the experiments which have been made up to the present tend to show that this is not the case. Some investigations† carried out at Marburg Experiment Station by Professor Haselhoff, though they cannot be regarded as conclusive owing to the soil being rich in available phosphoric acid, nevertheless suggest that steamed basic slag has no better effect than the ground slag, and, in fact, that the phosphoric acid in both varieties may be regarded as equal.

In a field experiment with mixed oats, barley, peas and vetches, the steamed slag gave very good results, which were nearly equal to those obtained from superphosphate containing an equivalent amount of soluble phosphoric acid. When applied to grass land, however, its action was inferior to that of superphosphate, but this was probably attributable to its application in the middle of April, the following months being somewhat dry, so that the basic slag did not have its full effect.

Destruction of Wood-lice.—The most effective means of combating wood-lice is to trap them. Baskets filled with damp moss, or little pots filled with moss and horse-dung, may be placed upside down here and there; the wood-lice will use

* *Le Petit Journal Agricole*, June 3rd, 1906.

† *Deutsche Land. Presse*, 4th April, 1906.

these as shelter places. Small heaps of wet leaves or grass will serve the same purpose. The pests will also collect under pieces of board, which may be wetted on the under-surface. All these traps should be regularly examined every morning. The wood-lice may be destroyed by dropping them into a vessel containing a little paraffin.

Eradication of Bracken.—If the surface of the ground admits of it, the best method of dealing with bracken on a large scale is to run chain harrows over the ground at the time the fronds are making their appearance. If this is done thoroughly and persisted in the plants are greatly weakened.

The Marsh Horse-tail.—This weed (*Equisetum palustre*) is regarded as being poisonous to cattle. Marsh plants, such as rushes and horse-tails, are indicative of soil that is wet and sour. Complete drainage is the best remedy. If this is impracticable, something may be done by removing the horse-tails as far as possible, and keeping the water-courses cleared out to allow of the free draining off of water.

ADDITIONS TO THE LIBRARY DURING AUGUST.

Canada—

British Columbia.—Department of Agriculture, Bull. 18:—Model Farm Buildings. (30 pp.) 1906.

Germany—

König, Dr. J.—Die Untersuchung landwirtschaftlich und gewerblich wichtiger Stoffe. (1,083 pp.) 1906.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 117:—Beiträge zum feldmassigen Gemüsebau. (51 pp.) 1906.

Heft 118:—Betriebsverhältnisse der deutschen Landwirtschaft. (221 pp.) 1906.

Great Britain—

Puxiey, H. L.—Modern Dairy-Farming. (238 pp.) 1906.

Cooke, Dr. M. C.—Fungoid Pests of Cultivated Plants. (278 pp.) 1906.
[Reprinted from the Journal of the Royal Horticultural Society].

Small Culture.—Edited by W. J. Malden. 2 vols. (68 + 80 pp.) 1904.

India—

Department of Agriculture for India.—Forest Bulletin, No. 6:—Memorandum on Mechanical Tests of Some Indian Timbers. (7 pp.) 1906.

Italy—

Ministero dell' Interno.—Organizzazione e Funzionamento dei Servizi di Vigilanza e Assistenza Zoiiatrica nel Regno. (302 pp.) 1906.

United States—

Bureau of Animal Industry:—

Circ. 96. Actinomycosis, or Lumpy Jaw. (10 pp.) 1906.

Circ. 97. How to get rid of Cattle Ticks. (4 pp.) 1906.

Bull. 83. Cold Storage of Cheese. (26 pp.) 1906.

Farmers' Bulletin.—No. 254. Cucumbers. (30 pp.) 1906.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of August, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 8	7 5	37 4	34 3
Herefords	7 8	7 2	—	—
Shorthorns	7 5	6 11	36 5	33 7
Devons	7 9	7 3	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7½	6¾	8½	6¾
Sheep :—				
Downs	8½	7¾	—	—
Longwools	8¼	7½	—	—
Cheviots	9	8½	9	8¼
Blackfaced	8	7¾	9	8¼
Cross-breds	8½	7¾	9¼	8½
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	6 11	6 5	6 5	5 11
Porkers	7 4	6 11	7 0	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 12	17 9	21 6	16 18
„ —Calvers	19 12	16 15	19 1	16 10
Other breeds—In Milk ...	17 9	14 15	18 8	15 8
„ —Calvers	15 7	14 12	18 11	15 13
Calves for Rearing	2 0	1 11	1 19	1 7
Store Cattle :—				
Shorthorns—Yearlings ...	8 14	7 7	9 1	7 14
„ Two-year-olds	12 15	10 19	13 13	11 4
„ Three-year-olds	15 16	13 17	15 17	13 3
Polled Scots—Two-year-olds	—	—	14 9	12 18
Herefords— „	15 1	13 0	—	—
Devons— „	12 0	10 5	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	36 1	31 11	—	—
Scotch Cross-breds	—	—	32 6	27 10
Store Pigs :—				
Under 4 months	30 2	22 9	27 4	24 0

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of August, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	50 0	49 6	51 6	—	56 6*	54 0*
	2nd	49 0	44 6	46 6	—	55 0*	47 0*
Cow and Bull	1st	—	42 6	43 0	38 6	44 6	42 0
	2nd	—	37 0	38 0	35 0	32 6	34 6
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	49 6	47 6	48 0	48 6	47 0	48 0
	2nd	46 6	42 0	44 6	44 6	46 6	—
Argentine Frozen—							
Hind Quarters ...	1st	31 0	34 0	32 6	33 0	34 0	35 0
Fore „ ...	1st	21 0	22 6	23 0	23 0	23 6	23 6
Argentine Chilled—							
Hind Quarters ...	1st	41 0	43 0	41 0	39 6	—	42 0
Fore „ ...	1st	24 6	27 0	28 0	28 6	—	29 6
American Chilled—							
Hind Quarters ...	1st	56 0	55 0	54 6	53 6	56 0	56 6
Fore „ ...	1st	33 0	34 0	32 6	32 6	35 0	35 0
VEAL :—							
British	1st	59 6	56 6	59 6	63 0	—	—
	2nd	53 0	39 0	55 0	58 6	—	—
Foreign	1st	65 6	—	—	—	—	—
MUTTON :—							
Scotch	1st	75 0	—	73 0	74 0	80 6	73 0
	2nd	70 6	—	68 0	70 0	65 6	62 6
English	1st	70 6	69 6	70 6	69 6	—	—
	2nd	64 0	55 0	66 0	65 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	30 6	34 6	34 6	34 6	32 6	35 6
Australian „ ...	1st	—	31 6	31 6	31 6	32 6	—
New Zealand „ ...	1st	36 0	36 0	38 6	38 6	33 0	—
LAMB :—							
British	1st	80 0	70 0	73 0	72 0	80 0	75 0
	2nd	75 6	64 6	66 6	67 6	74 6	64 6
New Zealand	1st	46 6	47 6	46 0	45 6	47 6	49 0
Australian	1st	—	43 0	—	—	—	—
Argentine	1st	42 0	42 0	—	—	39 6	39 6
PORK :—							
British	1st	59 0	58 6	60 8	60 0	56 0	55 6
	2nd	55 6	49 6	56 0	56 0	52 6	48 0
Foreign	1st	57 6	59 6	58 6	58 6	—	46 6

* Scotch.

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

			WHEAT.		BARLEY.		OATS.	
			1905.	1906.	1905.	1906.	1905.	1906.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France:	July	...	40 10	40 0	25 5	25 4	21 8	23 5
	August	...	39 5	39 7	24 11	25 1	21 0	23 2
Paris:	July	...	42 4	40 7	26 2	26 7	22 10	24 7
	August	...	41 0	39 11	25 7	25 10	22 1	24 4
Belgium:	June	...	31 8	29 9	24 0	24 2	21 8	22 4
	July	...	32 1	29 8	23 4	23 11	22 0	22 7
Berlin:	June	...	37 11	39 10	—	—	20 0	23 8
	July	...	37 9	39 8	—	—	19 7	22 10
Breslau:	June	...	{ 35 2	36 10	24 6	27 0 (brewing) 24 7 (other)	19 3	23 3
	July	...	{ 35 6	37 4	23 9	27 3 (brewing) 26 3 (other)	18 9	23 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of August, 1905 and 1906.

			WHEAT.		BARLEY.		OATS.	
			1905.	1906.	1905.	1906.	1905.	1906.
			s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	...	...	30 6	30 0	24 10	28 2	17 0	17 10
Norwich	...	...	30 2	29 7	23 0	20 5	15 7	17 6
Peterborough	...	...	28 2	28 9	22 6	24 6	16 8	17 0
Lincoln	...	...	29 4	29 1	22 11	20 11	17 1	17 11
Doncaster	...	...	30 8	28 11	—	—	17 5	19 2
Salisbury	...	...	30 3	30 6	25 5	21 11	17 1	18 3

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of August, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
British... ..	13 6	12 3	—	—	—	—	14 3	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	110 0	—	112 6	110 0	111 0	107 0	112 0	—
Danish	118 0	116 0	120 0	117 0	120 6	117 6	119 0	—
Russian	102 0	98 0	114 0	112 0	99 0	96 0	100 6	95 0
Australian ...	109 6	105 6	—	—	—	—	—	—
New Zealand...	111 0	107 6	—	—	—	—	—	—
CHEESE :—								
British, Cheddar	66 6	61 6	—	—	71 0	67 0	66 0	61 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	63 6	58 6	69 0	64 6	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	60 0	59 0	60 6	59 6	59 6	58 6	60 0	58 0
BACON :—								
Irish	70 0	65 0	70 6	68 0	72 0	69 6	70 6	68 0
Canadian ...	64 6	62 0	64 0	60 0	64 6	59 0	66 0	63 6
HAMS :—								
Cumberland ...	106 0	95 0	—	—	—	—	—	—
Irish	104 0	95 0	—	—	—	—	106 0	100 0
American (long cut) ...	66 0	65 0	67 0	63 0	64 6	61 0	66 0	62 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	12 6	11 5	—	—	—	—	—	—
Irish	10 4	—	9 6	8 9	9 2	8 5	10 8	9 4
Danish	9 10	8 10	9 11	8 5	9 9	9 0	9 2	8 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	65 0	60 0	—	—	56 6	48 6	—	—
Puritan	68 6	58 6	—	—	56 6	46 6	—	—
HAY :—								
Clover... ..	95 0	84 6	94 0	73 6	96 6	70 0	76 0	70 6
Meadow	84 6	74 0	71 6	61 6	—	—	74 6	69 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST.	
	1906.	1905.	1905.	1905.
Swine-Fever :—				
Outbreaks	57	77	769	592
Swine Slaughtered as diseased or exposed to infection ...	400	267	4,339	2,672
Anthrax :—				
Outbreaks	44	56	607	646
Animals attacked	51	71	891	894
Glanders (including Farcy) :—				
Outbreaks	72	111	739	836
Animals attacked	135	185	1,390	1,443
Sheep-Scab :—				
Outbreaks	6	6	299	654

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	AUGUST.		8 MONTHS ENDED AUGUST.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	13	31	74	124
Swine Slaughtered as diseased or exposed to infection ...	116	354	830	1,199
Anthrax :—				
Outbreaks	—	1	3	3
Animals attacked	—	3	7	5
Glanders (including Farcy) :—				
Outbreaks	2	1	6	13
Animals attacked	3	2	14	35
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	10	3	160	228

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THE LARGE LARCH SAWFLY. (*Nematus Erichsoni*.)

The importance of a careful outlook by the silviculturist and the arboriculturist in order to observe whether or no there seems to be any increase above the normal of a special insect, receives once more strong support in the recent ravages of larch, by the caterpillars of the large larch sawfly over a large area in Cumberland. We have in our country native species of forest insects which once and again on the Continent or elsewhere have been the cause of immense loss, and yet in Britain have never attracted attention by any serious damage, or, indeed, by any damage at all. There is always, however, the possibility of danger to our trees from such species, and this danger will grow with the increased area that may be put under forest crops, and with the massing together of great numbers of the trees of one species.

Nematus Erichsoni is not a very common insect in Britain or Europe generally. It is not even mentioned by name in the literature of wood or forest injury in Britain, and it is almost passed over in the Continental forest literature as of little forest importance. The increase, however, of this insect in the last three years over a considerable area in Cumberland, and the damage done by its larvæ there, is a matter of great importance, and may have, unless careful outlook be kept, grave results elsewhere. It were a pity, after the loss and discouragement caused by the larch canker fungus, if a second scourge in the shape of this sawfly enemy should follow. Our foresters should be on the alert against this possibility. The flood comes with a crack in the dyke. The worst insect plagues in forestry have originated in a limited area, and wherever the principle of "resisting

the first advances" is neglected a plague may follow which no man can cure.

Previous History of N. Erichsoni.—There are references in the forest literature of the Continent to the larvæ of the large larch sawfly as having been the cause of damage to larch in the Harz Mountains, in Holland and in Denmark. The references are chiefly antecedent to 1840; the most recent is from Denmark, in 1902. The insect has been recorded in Western Europe, from Sweden in the north to as far south as France.

As regards Britain, Cameron* writes: "*Nematus Erichsoni* does not appear to be a common species. I have only seen a specimen taken by the Rev. T. A. Marshall, of which I do not know the locality. Mr. Dale records it from Glanville's Wootton." Mr. C. O. Waterhouse, of the British Museum, courteously writes to me: "We have only three examples of *N. Erichsoni* in our British collection, and unfortunately they have no localities. Two are from Cameron's collection, one from J. F. Stephen's collection." Mr. F. V. Theobald, in *Nature* of September 20th last, gives as localities, "near Esher, Wye, Great Staughton, and Budleigh Salterton." Completer records would probably show a more extended distribution.

Nematus Erichsoni in America.—In the United States of America this sawfly has been catalogued as one of the most destructive forest insects, the larvæ, in the North-Eastern States, having at different times defoliated the larch. Until about 1882 the insect had not been regarded as troublesome. In a Bulletin published in 1881, *Nematus Erichsoni* was passed over, but in his next Report,† Packard told how in late August, in Maine, the caterpillars of this sawfly partially or entirely stripped the American larch or Tamarack (*Larix americana*) over a considerable area of swampy ground where the tree grew, the ability to grow in such a habitat making the tree a valuable one. The attack was continued in neighbouring parts in 1883, when again many trees were stripped and fatally injured. Similar infestation was reported from New Hampshire and Massachusetts. Then in Northern New York an extensive area of European larch was defoliated. Fletcher‡ has recorded

* "A Monograph of the British Phylophagous Hymenoptera," Vol. II., p. 57, 1885.

† Fifth Report of the United States Entomological Commission: "Forest Insects," by Packard, 1890.

‡ *Canadian Entomologist*, November, 1884.

enormous damage to larch in the summer of 1884 in and near Quebec by the caterpillars.

Defoliation of Larch in England.—During the past summer the caterpillars of *N. Erichsoni* have been at work in very large numbers over a considerable area in Cumberland. The trees cover the mountain up to an elevation of 1,600 feet. Part of the area is made up of pure larch, which suffered more than another portion of the wood where the larch is mixed with oak and a few other broad-leaved species. The attack was first observed in 1904; it was more serious with the spread of the insect in 1905; and again in the summer just past great havoc was done. Caterpillars were sent to the Board of Agriculture and Fisheries for determination and report in August of this year, and a visit to the affected district followed.

The worst infested area, known as Dodd Wood, is on Miss Spedding's Merehouse Estate, and is situated about four miles from Keswick in the Bassenthwaite direction. In shape the Dodd Wood is somewhat conical, hence is exposed to all points of the compass; the largest part, however, faces south. The age of the trees attacked varies from twenty years to seventy years and over, and the fact of tall trees being attacked adds greatly to the difficulty of satisfactorily combating the caterpillars and the adult sawflies. When I visited the place in the last week of August, the browned and withered appearance of many of the trees attested the severity of the infestation. At some hundreds of yards distance, looking up at the wood, the eye could easily pick out the defoliated trees. Some of them were practically in their winter condition, devoid of leaves. Others which had been defoliated in July had by mid-August started to produce new leaves, so that on inspection at the end of August such larches looked as they normally do in April or May, with the dwarf shoots bearing tufts or clusters of partly grown leaves.

Some seventy-year-old larches felled at the end of July and the beginning of August had thousands of the sawfly caterpillars on them. These caterpillars, many of them dislodged by the fall of the tree, made their way to the trees standing near and attempted to ascend them, the bases of the trunks of several hawthorns, for example, being hidden by their numbers. The caterpillars, numerous and easy to find on the trees up to

the third week of August, were by the fourth week, in the great majority of cases, full fed, and had left the trees and made their way into the moss and litter on the ground below, in order to make their cocoons. Here and there in such places on looking one found many cocoons and some caterpillars which had not yet spun up. I brought away with me abundant material from which I hope next year to clear up points in the biology.

On the 31st of August caterpillars were still to be found on the trees, but only after a very careful search. In addition to well-grown caterpillars, I took on this date very small caterpillars, not more than a few days old. One must not rashly assume that these tiny caterpillars were the result of a second brood of sawflies. There is the possibility that they were from eggs laid by sawflies that had issued from cocoons of 1905, but later in the season than the great majority. This *Nematus* infestation in Cumberland is serious, not only from the loss that it has already occasioned, but also because there are several other large tracts in the neighbourhood planted with larch which are in danger of infestation. There had been the intention too, on the affected estate, to plant another twenty-seven to thirty acres with larch, but this work has had to be held over on account of the presence of the sawfly.

Altogether in this neighbourhood an area of over 300 acres has been attacked. Examination of other larch woods near and of isolated larches here and there at a greater distance showed that there were still uninfested places, but the danger of infection is great. That the attack is not limited to the Merehouse Plantation and immediate neighbourhood is seen in a letter to the Board from Mr. Smith Hill saying that since the outbreak at the Dodd Wood he has found cocoons in abundance in Coomb Plantation. Coomb Plantation is on the other side of the Derwent Valley from the Merehouse Plantation. It is situated four miles from Keswick in a north-westerly direction, and lies between 1,000 feet and 1,500 feet above the sea level. The plantation is sixty years old, and extends to 200 acres. Mr. Smith Hill has also been informed of attack on Shoulthwaite Wood, near Thirlmere Lake.

Position of Nematus Erichsoni in the Insect World.—The large larch sawfly belongs to the order Hymenoptera—an order containing, amongst other insects, the bees, wasps, and ants. The

family of Hymenoptera which has the greatest interest for the forester is the *Tenthredinidæ*, or sawflies. The sawflies are so called from the fact that the ovipositor of the female is modified, typically, to form a sawing apparatus, by which the openings are made in leaf or twig for the reception of the eggs. The two saws are side by side on the under surface at the hind end of the sawfly. The adult sawflies do not attract much notice, but if examined it will be seen that they do not have the narrow waist characteristic of the wasps, but that the base of the abdomen is broadly joined to the thorax. The adults, in nearly every case, are harmless, save that, of course, they lay the eggs. The larvæ are very characteristic: they are caterpillars, with more than sixteen legs (the caterpillars of the genus *Lyda*, troublesome on fruit and forest trees, have eight legs, six in front and a pair behind, and the corn sawfly, *Cephus*, if included under *Tenthredinidæ*, would be another exception), and they feed in the great majority of cases exposed; a few, however, live in galls, or mine or burrow in plant tissue. Dr. Sharp reckons that nearly 400 species have been found in Britain, and amongst these are species troublesome in gardens, and to fruit, and in agriculture. Six or seven genera contain species of importance in forestry, of which *Lophyrus* (see Leaflet 103), *Lyda*, and *Nematus* are the most important.

The species of the genus *Nematus* that have relation to forestry affect, amongst broad-leaved species, the willow chiefly. The interesting, and sometimes injurious, caterpillars of *Nematus septentrionalis*, besides feeding on willow, attack also the leaves of birch, hazel, alder, and mountain ash. On the larch, besides *Nematus Erichsoni*, the large larch sawfly, I notice later, for comparison, *Nematus laricis*, the small larch sawfly.

Description of Nematus Erichsoni.

Adult.—The adult sawfly measures up to $\frac{3}{8}$ inch, or a little over, in length, and in spread of wings just less than an inch. The ground colour is black. The head and thorax are black; the first joint of the abdomen is black; then follow joints coloured red; the end of the abdomen again being black. The mouth parts, the two front pairs of legs, except at the part next to the thorax, and the upper parts of the femora of the hind legs, are reddish or reddish-yellow. The tibiæ are yellowish or pale in the upper parts. The antennæ are nine-jointed and some-

what thick, and taper towards the apex. With a lens the head and thorax are seen to be sparsely and finely pubescent, and the thorax is markedly punctured. The wings are glassy and slightly clouded below the stigma.

Egg.—The egg is longish oval, and measures just over a millimetre in length. It is white in colour.

Larva.—The full-grown caterpillar measures three-quarters of an inch, or a little over, in length. It has a round black hairy head, with a single ocellus on each side. On the upper surface, all down the back, the colour is grey-green; the sides are lighter; the under surface is yellowish-green. If one uses a lens there will be seen on the abdominal segments transverse rows of minute warts with spines. The spiracles along each side are brown. The legs number twenty, viz., three pairs of thoracic legs, which are black, and seven pairs of abdominal legs, which have the colour of the underside of the body. The head is followed by twelve segments or joints—1, 2 and 3 are thoracic joints, and each bears a pair of legs; 4 to 12 inclusive, are abdominal joints; 4 has no legs; 5, 6, 7, 8, 9 and 10 have each a pair of legs; 11 has no legs; and 12, the last joint, carries a pair of legs. Packard* describes the caterpillar as moulting three times, and so distinguishes four stages of larva. On hatching, the head is very large and dusky green, not black; neither are the thoracic legs black; the body is uniformly pale green. After the first moult the head and thoracic legs are black: the body is wrinkled, but no warts show. After the second moult the upper surface is grey-green, and the transverse rows of warts appear. The caterpillar attains its full size after the third moult. The moulted skins can be seen wound round or attached to the leaves.

Excrement.—The castings (excrement) of the caterpillar are longish, cylindrical, and somewhat square cut at the ends. The castings observed on the ground will afford a hint as to the presence of the larvæ. So numerous were the caterpillars in some parts of the attacked area that in July their excrement falling on leaves below suggested the patter of rain drops.

Cocoon.—The cocoon, strong and leathery or parchment-like is dark brown in colour; it is cylindrical in shape, with rounded

* Fifth Report of the United States Entomological Commission: "Forest Insects," 1890.



THE LARGE LARCH SAWFLY.
(*Nematus Erichsoni*.)



ends; the inside is smooth, the outside shows a raised network pattern. The size may be taken on the average as between $\frac{3}{8}$ inch and $\frac{1}{2}$ inch. I have some from the soil less than $\frac{3}{8}$ inch, but these may contain parasitized larvæ.

In answer to inquiries I give below tables which may assist in making certain the determination of the large larch sawfly.

MOTH CATERPILLARS.

Head somewhat hollowed out and not so globular.

A group of ocelli on each side of the head.

Hooklets on the abdominal legs.

Legs 16 in number or less.

The Geometer moth caterpillars, of which at least three species feed on larch, have a less number of legs than 16. The caterpillars of the larch mining moth (this was quite common in Cumberland, and is often a serious enemy of the larch) mine into the needles, causing the upper half to shrivel up; these caterpillars are very minute, and make cases for themselves in hollowed out parts of the needles.

THE LARGE LARCH SAWFLY.

Nematus Erichsoni.

Adult 10 mm. in length, and with red on the abdomen.

Thorax prominently and thickly punctured.

The eggs are laid on the young shoots.

Caterpillar measures up to 22 mm. and is grey-green on the back, lighter on the sides.

Head of caterpillar black.

Caterpillars eat till the end of August.

The caterpillar eats especially the leaf clusters or tufts.

SAWFLY CATERPILLARS.

Head globular.

One ocellus on each side of the head.

No hooklets on the abdominal legs.

Legs more than 16.

Genus *Lophyrus*. Genus *Nematus*.

e.g., the pine sawflies,
not found on
larch.

The caterpillars have 22 legs. The caterpillars have 20 legs.

THE SMALL LARCH SAWFLY.

Nematus laticis.

Adult 6 mm. in length and quite black.

Thorax not prominently punctured, and may be quite smooth.

The eggs are laid on the buds.

Caterpillar measures up to 15 mm., and is grass-green or greenish-brown.

Head of caterpillar brown.

Caterpillars full grown in July.

The caterpillar eats more commonly the single leaves on the shoot of the current year.

Life History and Habits of the Large Larch Sawfly.—The caterpillars winter under cover of the cocoons and pupate, generally speaking, in May or June, according to the conditions. I know of no records in Britain giving dates of the appearance of the adults, but probably they issue in June. The eggs are laid, in one or two rows, on the youngest larch shoots, and in slits in the bark made by the saws. Packard saw the eggs laid at the bases of the young leaves. (It will be recalled that on the new shoot or shoot of the current year in the larch the leaves are not in clusters but are arranged singly.) The presence of the eggs may cause the shoots to curl somewhat, and on occasion the leaf at whose base an egg has been laid, dies. Packard *

* Fifth Report of the United States Entomological Commission: "Forest Insects," 1890.

observed a female in confinement, and thus describes the egg-laying:—"The sawfly stood head downward while engaged in making the puncture, and was not disturbed by our removing the larch twig from the glass jar and holding it in our hand while watching the movement of the ovipositor." (This same restfulness I have observed in the pine sawfly (*L. pini*) while watching a female in captivity laying her eggs.) "The serrated blades of the ovipositor were thrust obliquely into the shoot by a sawing movement. After the incision was sufficiently deep the egg was forced out of the oviduct by an evident expulsive movement of the muscles at the base of the ovipositor. The slit or opening of the incision after the egg has passed into it is quite narrow and about $1\frac{2}{5}$ mm. in length. While engaged in the process the antennæ are motionless, but immediately after the ovipositor is withdrawn they begin to vibrate actively, the insect being then in search of a site for a fresh incision." As the embryo develops the slits in the shoots gape a little, and through the oval hole the caterpillar creeps on hatching. The caterpillars may begin by gnawing the single leaves on the young shoot, but they soon pass to the clusters of needles on the dwarf shoots. Single leaves may be eaten so that the edges appear serrated, or the clusters of leaves may be half eaten or quite destroyed so that only stumps are left.

In the young condition the caterpillars may be found in clusters. The caterpillars assume various positions, arranged with the tail end curled round the shoot; or like a mark of interrogation, or the letter S; or (a characteristic attitude) with the hind half of the body turned upwards and over the front half. On being handled the caterpillars would wriggle violently rolling themselves about in a fashion that reminded one of surface caterpillars, and ultimately lying on their side with their body forming a circle, the tail end touching the head.

The larvæ are to be found at work during the summer, and most numerous in July and the first fortnight of August. By the end of August most have left the trees. Some, however, do not complete their growth till September. I kept some in confinement that made their cocoons in the second week of September. The full fed caterpillars leave the trees and pass into the moss or litter or the soil below, and in such shelter places spin the cocoon in which they pass the winter. They lie

somewhat bent in the cocoon until the late spring or summer of the next year, when they turn to pupæ, the adults issuing in due course.

There is no evidence so far that there are two generations in the year, and yet the caterpillars seem to attain full size in a comparatively short time. It is interesting and sometimes puzzling as to why from cocoons collected and possibly made at the same time and kept in the same conditions, there should be such variations in the escape of the adults. For example, in my recent experiments with *Lophyrus pini*, the Pine Sawfly, in 1905, from cocoons collected in the winter of 1904 and kept indoors, 117 adults issued, these insects appearing on thirty-seven different days between April and August, the first coming away on April 14th, and the last on August 1st. In 1906, from a number of cocoons made by the caterpillars in confinement in 1905 and kept indoors 104 adults issued, the insects appearing on thirty-two separate days, the earliest on the first of June and the last at the end of the first week of August. The practical import of this is that as egg-laying takes place at different times according to the different flight times of the adults, infestation must be expected not merely at some limited definite period, but any time during the summer when the temperature is favourable.

Age of Tree Attacked.—Infestation in the larches in Cumberland was upon trees of from twenty to seventy years of age. The records elsewhere show that young plants of ten years of age may be attacked, but attack has been reported more frequently on older and taller trees. In one case in Washington County, United States, larches less than 25 ft. high had been spared, but of those of 30 ft. and upwards 90 per cent. had been attacked and almost completely defoliated. The fact that the caterpillars work on well-grown trees, and it seems characteristically at the crown first, increases greatly the difficulty of fighting them.

Preventive and Remedial Measures.—1. As against the adults scarcely anything can be done effectively. They lay high up, well out of reach, so that the placing here and there of tarred boards standing erect and with the tar frequently replenished, which is practised sometimes against sawflies that lay on young plants, cannot be tried with hope of success.

2. If young trees chance to be affected with the caterpillars,

the caterpillars, especially when they are small and, it may be, in clusters, should be squeezed in a gloved hand or rubbed off the shoots into a small hamper; or badly infested shoots could be snapped off or cut through and dropped into the hamper. The contents of the hamper are then emptied on a slow-burning fire. This measure practised against the pine sawfly will often be quite impracticable against the caterpillars of the large larch sawfly, feeding as these do, out of reach.

3. Jarring so as to shake down larvæ would meet with most success on a dull day or early in the morning when the caterpillars are cold and sluggish.

4. Where the caterpillars are out of reach, and the tree attacked is isolated, or where the infestation is limited, the trees should be sprayed with hellebore, or Paris green, or arsenate of lead.

5. When infested trees are felled the dislodged caterpillars should be destroyed.

6. There is a certain amount of help from nature. Birds may take the caterpillars; in the Dodd Wood rooks and jackdaws were seen to be feeding during July on the caterpillars. Parasitic ichneumon flies are active enemies of the caterpillars.

7. The cocoon stage comes within reach of practicable treatment if the infested area be not too wide. The litter and surface soil below trees that were attacked could be ploughed in deeply so as to bury the cocoons, or in a prescribed area boys could be employed to collect them, or the soil and litter and moss could be collected together in little heaps. If quicklime were placed on these and water sprinkled over them the heat engendered would kill the enclosed caterpillars. Swine, useful in some insect infestations against pupæ in the soil, are not employable here as they refuse to eat the cocoons.

Description of Figures:—Fig. 1, *Nematus Erichsoni* (magnified); Fig. 1A, *Nematus Erichsoni* (natural size); Fig. 2, Larva; Fig. 3, Excrement of larva; Fig. 4, Two cocoons, each magnified $1\frac{1}{2}$ times; Fig. 5, Larvæ on twig of larch; on one of the needles a moulted skin is seen; Fig. 6, Some injured leaves magnified; Fig. 7, Larch twig defoliated by the larvæ. Fig. 8, Larch twig, drawn in September, that had been defoliated and now putting out new leaves. Figs. 1 and 1A after Packard, all the others drawn from nature.

R. STEWART MACDOUGALL.

THE MARKETING OF POULTRY.

The demand for high-class poultry in Great Britain has very greatly increased in recent years, and, even apart from the growth in the population, there appears to be ample room for extension. In addition to large supplies which are received from Ireland, poultry, including fowls, geese, ducks, and turkeys, is imported from Russia, France, Germany, Holland, Italy, Belgium, and the United States and Canada. The total value of the imports in 1905 was £906,000, to which Russia contributed £275,000, France £227,000, Belgium £194,000, and the United States £152,000. The amounts credited to France and Belgium include, it is believed, consignments from Italy, Germany, and other Continental countries coming through French and Belgian ports. The Russian supplies, which are sold generally at low prices, compete with unfattened poultry, while the American and other imported fowls are generally fattened. Russian poultry begins to arrive in December, and the supply generally lasts till May or June.

The best markets in the country are those of Leadenhall and Smithfield, in London, but to obtain good prices there the birds sent up must be very carefully fed. A recent report by the Irish Department of Agriculture contains the following remarks on this subject:—

“London is generally believed to be, practically, the only market in the United Kingdom for the sale of crammed chickens. Crammers usually send their consignments to salesmen in Leadenhall and Central Markets, and their experience has shown that for the very best and finest quality birds of 5 lb. weight and upwards, London is undoubtedly the most profitable outlet. The “returns” in some instances, however, have displayed great disparities in prices in the same consignment, and this is alleged to be due to difference in size and variation in quality. Where the latter is the case, the remedy lies with the sender, who should exercise more care in selecting his birds for fattening and in grading them for sale purposes. In the former case it is possible that for sizes under 5 lb. as good or better markets exist in the provinces.

“The market in London is apparently never overstocked with crammed birds of best quality 5 lb. each and over. Smaller

birds and birds of inferior quality are often a drug on the market, and are cleared at a price that can leave no margin of profit to the crammer.

"These smaller-sized birds, if of good quality, might be sold at paying prices in English and Scotch cities which are nearer to Ireland than London, and in which the market for high-class chickens 3 to 5 lb. in weight each is rarely over-supplied."

A list of some of the best markets outside London is given on the next page.

In the London markets the best season for smaller but well-fattened fowls is from November to February, and from March to June for larger ones. Ducklings sell fairly well all the year round, but best from February to June; goslings in May and June and at Michaelmas; fat geese at Christmas and for a short time afterwards, but their season is limited. Turkeys fetch high prices, according to size, appearance, and straightness of breast bone, at and for a very short time after Christmas. As to days of the week at Smithfield (Central Market), Tuesdays, Thursdays, and Fridays are best; at Leadenhall, Mondays, Wednesdays, and Thursdays.

Birds should be sent to the market early, and it is essential that they should be well graded and packed.

In preparing poultry for the market, the following hints may be found useful:—

Killing.—All birds should be starved for twenty-four hours previous to death in order that the carcase may keep the better. They should be killed by dislocating the neck just where it joins the head, unless the purchaser wish them to be killed in a special way. Some few salesmen like them to be bled, after having had their necks broken, by a knife put through the slot in the roof of mouth, but this is rarely wanted and is apt to soil the packing and thus spoil the price of the whole consignment. Dislocation of the neck properly performed results in the breaking of the jugular vein, and the bird bleeds perfectly well.

Plucking.—Birds should always be plucked before the body becomes cold so that the feathers may come out more easily and that there may be less danger of tearing the skin, for except among the poorer class of buyers a badly-plucked bird is of but little value.

Provincial Markets.

Town.	Season.	Prices Paid		Remarks.
		per. couple.	per. lb.	
Bath	Any time... ..	4/- to 6/-	—	Poor prices for any but those having white legs.
Birmingham ...	Do. from Dec. to May, prices rule as much as	6/- ,, 8/-	—	Kidderminster is a large buying centre for this town and prices given are excellent. Turkeys must have straight breast bone.
Blackpool ...	July, Aug., Sept...	4/6 ,, 7/-	—	—
Bournemouth...	Christmas to end of May	4/- ,, 7/	8d. to 1/-	White legs only.
Bristol	March to June ...	4/- ,, 7/-	—	Black legs sell badly, but yellow legs are preferred by certain poulterers.
Burnley	Oct. to June ...	—	9d. ,, 10d.	Most birds make 6d. a lb. live weight provided they are starved ready for killing.
Cam' ridge ...	Any time... ..	4/- ,, 6/6	—	Not larger than 4 lb. in weight and the legs must be white.
Cardiff	Any day but Monday	5/6 ,, 6/6	9d. ,, 10d.	Carriage paid. Legs must not be black.
Ches'er	Any time... ..	6/- ,, 7/-	—	Yellow legs sell best.
Cromer	July, Aug., Sept...	4/6 ,, 6/-	—	Birds sell well at other seasons.
Croydon	Sept. to Jan. ...	4/6 ,, 7/-	—	—
Eastbourne ...	Any time... ..	5/6 ,, 9/-	—	A first-rate market all the year round for white-legged varieties.
Greenock, N.B.	Christmas and New Year week	3/6 ,, 7/-	—	—
Leamington Spa	Any time except Aug. and Sept.	4/6 ,, 6/-	—	White legs preferred.
Leicester	Any time... ..	—	6d. ,, 11d.	Birds are also sold per couple.
Penzance	June 1st to Sept. 30th	4/6 ,, 6/6	—	—
Rochester	Any time... ..	5/- ,, 7/-	—	No sale for poor qualities.
Southend-on-Sea	June to Oct. ...	5/6 ,, 8/-	—	No sale but for white legs.
Swansea	March to Oct. ...	4/6 ,, 7/-	—	—
Torquay	August to May ...	4/6 ,, 7/-	—	—

The plucking should begin at the tail and be continued in the following order : back, neck, wings, sides, legs, and breast. Do not start with the breast, as the surface veins in that part of the body are the last to drain dry and the carcase will be discoloured

if any of these veins are broken. Do not break the breast bone.

Pluck fowls clean except for the head and half the neck ; in turkeys pluck the body clean but leave the hip feathers on back and those on small ends of wings ; in ducks and geese leave the wings and half the necks unplucked.

The legs and feet of all birds should be very carefully cleaned.

Shaping.—When quite clean the birds should be singed and placed breast downwards in a shaping trough with the heads hanging over the front board, and left in this position for the flesh to set and to cool.

A long narrow board is then placed along their backs and upon this weights are placed, the usual thing being to use a common 9-lb. brick to every two birds. In placing the birds in the trough, the stern is pushed hard up against the back board, so giving the birds a shortened appearance.

Should a shaping trough not be available, the birds should be tied down in Devonshire fashion. This is as under :—

Immediately after plucking remove the back claws and make a gash on each side of the middle toe. Tie a short string to each of these toes, draw the legs forwards and inwards, and tie the two strings together behind the neck, pulling them tight.

Tie a second and rather longer string round the hocks, cross it on vent, and fasten it at the back of the tail, again pulling tight. Tuck in the wings and the bird will be ready for packing directly it is quite cold. Care should be taken that birds are not packed while still warm.

Birds for the West and North of England should not be shaped.

Grading.—This is of great importance. It is very desirable that only birds of about the same size should be packed together, but if those of different sizes are to be packed together, they should be put in layers, and the fact that they are so packed should be stated when advising buyer of despatch. The sizes may be 3 to 3½ lb., 3½ to 4 lb., 4 to 4½ lb., and 4½ to 5 lb. It is best for separate boxes to be used for different sizes. Each box should be marked with a distinctive brand and have the number and size of the fowls clearly shown.

Forwarding.—Send a postcard to the buyer or salesman telling him by what route and train the crate will travel, and mention by what mark he will be able to identify the crate.

The crate should travel by an evening train so as to reach the markets in the very early morning, and it should be consigned at dealers' rates.

Ducks and geese should be sent in very rough but strong crates, with the actual weight of the contents marked on one end outside. About ten large or fourteen small geese go to a crate.

There is a growing demand for goslings weighing from 6 to 8 lb. during the London season—from the middle of May to the end of June. Goslings sent in then are off the ground before keep becomes valuable for other farm stock.

In Surrey it is the practice after the birds have been shaped for them to be floured and packed in specially made boxes called "pads," which are of different sizes and hold respectively twelve, sixteen, twenty, and twenty-four birds. Each bird is laid breast downwards on clean straw, being as tightly packed as possible to prevent them shifting on rail. Clean butter paper is, by the best packers, placed between each layer of birds to prevent the straw marking the backs and rubbing off the skin. Though this means a few more minutes per package, it brings a more ready sale and is well worth doing.

The chickens need not be drawn as a rule, but some buyers prefer them to be "roped," that is, to have the intestine drawn out at the vent, leaving the rest of the inside intact. This is frequently done in the Midlands and in Ireland. Unless the distance from the market is considerable, the birds are unpacked and sold within a few hours of despatch, so that this is not generally necessary.

It is the custom on farms to keep old hens about long after they are really profitable from a laying point of view. Very rarely is a hen worth her keep after the conclusion of her second year. Local higglers buy them at what one may term starvation prices. These hens may usefully be fattened up for sale in London at Easter—when there is a large demand by Jews for fowls. If sent up they must be fat, not merely fleshy. The best day for them to arrive in London is the Thursday before Easter, and they should leave the farm station the night before

by the milk train. They should be packed alive in "flats," fourteen to twenty in a crate according to size, in lots of not less than twenty if from any distance, when it will be found that railway carriage usually works out at under 3d. per bird and commission at about the same. The prices vary from 2s. 6d. upwards per bird.

In connection with the trade in fattened poultry, the following observations by the Irish Department of Agriculture are of interest:—

"Trade not always Profitable.—It must not be assumed that chickens can always be bought at current rates in Ireland, crammed and sold at a profit. In certain months of the year, on the contrary, the work must result in loss, and during a big game season this loss may be very considerable. From a profit and loss standpoint the period from middle of September to middle of December is the most difficult time of year for the crammer; it is not easy to stop the work during these months and take it up again when prospects improve, neither is it possible to have at all times certain orders awaiting the time when chickens are ready for killing. The ideal condition would be for the orders to be in hand and the birds then to be bought at a price that would leave a margin after cramming and other expenses were added. This idea may be worked for, though it is not easy of attainment.

"Cold Storage.—To meet these difficulties other countries have resorted to the cold storage of poultry. Inquiries have been made on this matter, and there seems to be no doubt that America and Russia largely use this aid in the conduct of their poultry work; that when birds cannot be sold at remunerative prices, they are cold-stored till prices rise; that prices do rise, and birds so stored are then sold as cold-stored chickens, realising a profit on the original cost, the expenses of storage and interest of money; that a system of "warrants" are issued against cold-stored produce, upon which advances are made to holders of good standing by their bankers; that, further, Irish birds have been cold-stored when prices have been low (in 1905) and sold (in 1906) when prices have risen; that the quality has been approved by the buyers." The much better prices realised turned the loss, which would have occurred if the

birds had been sold when killed, into a profit. It is believed that a somewhat similar system obtains in New Zealand, from which Colony, despite the distance, large numbers of poultry are sent to South Africa. One large consignment at least has been sent to this country.

An article on the "Fattening of Poultry" appeared in this *Journal* in May, 1906, and will shortly be issued as a leaflet, No. 176.

C. E. J. WALKEY.

The work of agricultural investigation and research in the United States has made very great progress in recent years.

**Agricultural
Experimental
Work in the
United States.**

There is, in the first place, the Department of Agriculture, which is devoting itself more and more to scientific work, and becoming, in fact, a central experiment station, and, secondly, there are the agricultural experiment stations established in 1887 in each of the States and territories. There are now sixty of these, of which fifty-five receive grants from the National Government. The Act establishing the agricultural experiment stations made them practically independent of one another and of the Department of Agriculture, but the relations between these bodies have in reality been very close. To quote Dr. E. W. Allen, the Assistant Director of the Office of Experiment Stations,* "they have been drawn together by a common purpose, and as their work has progressed they have often found themselves in positions of mutual helpfulness and dependence. They have developed together. Together they have demonstrated the utility of agricultural investigation, and shown its practical importance to the farmer and horticulturist. They have laid the foundation of a science of agriculture as a basis for teaching, and have won the confidence and appreciation of the general public to such an extent as to make their continued development possible."

The period covered by the experiment station movement has seen a great change in the Department of Agriculture, both in character and in material equipment. The Department has

* "Year Book of the Department of Agriculture," 1905.

become in effect a great experiment station, with probably the largest *personnel* and the most liberal appropriations of any institution of its kind.

It is divided into a number of bureaux or offices dealing with different classes of agricultural matters, and grants are made to these bureaux, which include not only the salaries of the scientific and administrative staff, but also sums expressly allocated to various investigations, or, in some cases, lump sums for research into a number of allied questions, the distribution of the money being left to the discretion of the Secretary of Agriculture. Thus the Bureau of Plant Industry investigates diseases of plants, undertakes the breeding and selection of new varieties of fruit, cereals and cotton, and also receives separate grants for pomological and botanical investigations, enquiries into grass and forage plants, tea-culture and the growth of sugar beet. In the same way the Bureaux of Forestry, Chemistry, Entomology, Soils, &c., undertake experimental work on matters coming within their scope. In the past, the work has largely had the character of scientific research in the laboratory, as the Department has only recently acquired an experimental farm. Speaking generally, the Department is strong in laboratory facilities, and has the advantage of the assistance of men who are recognized experts in special subjects, but it possesses very little provision for carrying out experiments on a practical basis or under field conditions. The writer previously quoted points out that this is a wise provision, as the conditions at Washington would be representative of only a small fraction of the country. On the other hand, the local experiment stations are usually strong in their provision for practical work and for the testing of theories on a practical basis. Nearly all of them have farms at their disposal, with experimental fields, orchards and live stock. They have the advantage of a close association with practical farming operations and intimate relations with the farmers. They have, therefore, the real problems of their districts brought home to them in a variety of ways.

The Department, however, possesses the advantage of material resources to a far greater extent than the stations. The total income of the fifty-five stations is about £285,000, whereas the vote for the Department (excluding the Weather Bureau) was

£1,144,000 in 1906, and although an important part of the latter sum is absorbed by administrative work, yet the balance available for research is very large, compared with the resources of any individual station.

The natural outcome of this position should obviously be one of mutual help and interdependence, and in recent years there has been an increasing co-operation in experimental work between the Department and the separate stations. The importance of this has been recognised by Congress, which in the Appropriation Act of the present year places the aid of the Department at the disposal of the stations in a variety of ways. For instance, in making grants to the Department for conducting experiments in animal breeding and feeding, plant breeding and selection, for testing new plants, for studying the influence of environment upon plants, market conditions affecting the fruit and vegetable trade, cereal production and for many other subjects, specific mention is made of the experiment stations as co-operating agencies. This union of facilities and resources may be said to recognize the fact that the Department usually has the advantage in point of funds, in possibly a broader survey of the general field, and it can often place a larger number of specialists and assistants in the field, whereas the stations have the plant for carrying on the work as well as a superior knowledge of local conditions.

The dissemination of information as to the results obtained also affords an illustration of the way in which the Department and the stations supplement each other's efforts on behalf of the American farmer. As is the case in England, the effort to reach the farmer effectively is a most difficult task, but there are in the United States three different agencies, one of which is almost unknown in this country. There are (1) publications; (2) practical demonstrations; and (3) talks and addresses at meetings and farmers' institutes.

Publications.—The Department of Agriculture issued in 1905 476 different publications, apart from reprints, and approximately 12½ million copies of bulletins and reports were circulated. Nearly one half of these were farmers' bulletins prepared especially for popular consumption. The experiment stations in the same year issued 461 bulletins and reports, of

which about 6½ million copies were distributed. The lists of persons who receive these publications regularly now contain 731,000 names. The issue of these bulletins is restricted by want of funds, but the summaries which appear in the Department's publications bring them to the notice of many persons who would not otherwise be reached.

Practical Demonstrations.—Practical trials and demonstrations are becoming a somewhat more prominent feature, and both the Department and the stations have undertaken work such as spraying potatoes and orchards, treatment of seed for smut, alkali reclamation, irrigation, cold curing of cheese, &c., in localities where such matters seemed specially applicable.

Farmers' Institutes.—This means of education has been described as the Adult Farmers' School. They are meetings at which lectures are given and subjects discussed, and are held sometimes for one day, once a month, and sometimes at longer intervals for two and occasionally for four or six days. They date from early in the seventies, and are now an important factor in American agricultural life. They are held in nearly all the States, and in 1903 the attendance was about 900,000. It will easily be understood that they afford a valuable means of instructing farmers in improved methods and practices, and of bringing the results of the work of the stations home to them. In twenty-nine States the management is entirely in the hands of the colleges and stations, and in the others the station officers take a prominent part. There is a great demand for these men as lecturers. The Department has not taken much action in this direction, but a considerable number of officials have been sent to meetings in response to special requests.

A novel form of instruction which has been adopted in Iowa since 1904 was the employment of a special train from which lectures were given by experts for the purpose of emphasizing to farmers along the route the importance of seed selection in growing corn, wheat, and potatoes, and also for instruction in dairying. In 1905 this train covered 7,855 miles during 57 days, stopping at about ten different places each day, two lectures being delivered at each place. The audiences are estimated as numbering over 127,000, or an average attendance of 110 at each lecture.

In other States excursions have been run to bring farmers to the college and station, in order that they might see for themselves what was being done, and have the aims and applications of the experiments pointed out to them. In North Dakota, for example, these annual excursions have been a feature for several years past. In the morning the party is conducted round the fields, stables, and dairy, and in the afternoon a meeting is held in the assembly hall, where questions are answered and short addresses given on subjects of interest.

It is obviously impossible to estimate the effect of all the experimental work which has been carried out during the past twenty years, but there seem to be a number of instances in which its influence can be definitely traced. This is particularly the case in the introduction and distribution of new crops and new varieties, such as kafir corn, durum wheats, numerous kinds of other cereal and forage crops, and sugar beet. A number of these introduced crops are regularly grown in many States, and a large number of the new varieties have now become more popular than the common sorts. The "Year-Book of the Department of Agriculture" contains an interesting article by Mr. G. J. Schulte, of the Office of Experiment Stations, in which he endeavours to trace the influence of experiment station work on the culture of field crops. The extension of the cultivation of new varieties affords naturally the most striking and obvious examples, but numerous changes in methods of cultivation which have taken place in the last fifteen or twenty years seem largely attributable to the teaching and practical work of the experiment stations.

The vast areas of land open to cultivation in the United States as well as the varieties of climate and soil, have naturally encouraged the introduction of new crops, and even as early as 1839 a sum of about £200 was voted by Congress for the purchase of seeds of new and rare varieties of plants, and from this time seeds continued to be distributed annually. Between the years 1839 and 1880 a number of important new crops were introduced, but the distribution of seeds, especially after 1880, was chiefly confined to

**New Crops
in the
United States.**

standard varieties of vegetables and flowers. In 1898, however, £4,000 was voted for the purpose of obtaining from abroad varieties of plants adapted to conditions in the United States, thus bringing back this work to its original purpose.

Among the crops which have been introduced at different times through the agency of the Department may be mentioned sorghum, which is at present grown throughout the United States ; kafir corn, largely grown in the semi-arid South-West ; durum wheat, recently introduced as a crop for growth on land too dry to grow other wheats ; Japanese kinshu rice, the introduction of which has resulted in a large increase in the rice crop in Texas and Louisiana ; as well as Swedish oats, white Schonen oats, chevalier barley, and Fultz wheat, which were introduced some thirty years ago.

At the present time an endeavour is being made to find a disease-resistant variety of cotton, while great attention is given to the introduction of grains suitable for the arid and semi-arid regions extending from North Dakota to Texas, and for the high altitudes of the Rocky Mountains. Other experiments are concerned with disease-resistant potatoes and water-melons, the cultivation of cassava, the vanilla bean, the mango, and other tropical fruits, and of the date-palm.

In a memorandum issued by the Board of Agriculture and Fisheries on 24th September it is stated that further reports from the Crop Estimators of the Board tend to confirm the expectations formed last month as to the prospects of all the principal crops with the exception of roots and potatoes. The corn harvest is for the most part over, and the exceptionally favourable weather has generally enabled the crops to be quickly secured in excellent condition. On the other hand, the prolonged drought has had a detrimental effect upon potatoes and roots, and upon the second growths of grass in nearly all divisions of England.

Wheat, which was represented in August as being probably 5 per cent. over-average, has declined to the extent of about one-

half per cent., but a yield exceeding the average is still expected in each division of Great Britain. Barley seems to have improved by about 1 per cent., and is also represented as being over-average in every division. In oats no general alteration is indicated, and the crop is described as above the average everywhere, except in the Northern division of England and the East of Scotland.

The depreciation in the potato crop, occasioned mainly by lack of rain, is put at about 2 per cent., the yield now indicated being slightly below the average. While mangolds do not appear to have been much affected, turnips and swedes suffered from the lack of rain to an extent which is put generally at about 4 per cent.

The position as regards fruit and hops does not seem to have been appreciably changed since the August report. Hops are still reported as the most deficient crop of the year, but the quality is said to be exceptionally good in most cases.

Summarizing the reports, and again representing an average crop by 100, the prospects of probable yields for Great Britain as a whole may now be represented by the following percentages:—Wheat, 105; barley, 104; oats, 102; potatoes, 99; roots, 101½.

Germany.—According to the Report of the Imperial Statistical Bureau for the middle of September, the condition of the potato crop was not very favourable, and the numerical estimate was 2·8, compared with 2·6 in August and 2·4 in July (1=very good, 2=good, 3=medium or average). A good deal of disease is reported, and the better kinds of potatoes leave much to be desired. Complaints are also made of degeneration in certain kinds which have been in cultivation for many years, especially the Magnum Bonum, in regard to which a note appeared in this *Journal* (February, 1906, p. 671).

According to the preliminary returns of the Imperial Statistical Bureau the areas devoted to the principal crops are as follows:—

**Notes on
Crop Prospects
Abroad.**

Crop.						1905.	1905.
						Acres.	Acres.
Wheat	...	...	...	...	...	4,781,927	4,760,004
Rye	...	...	...	...	...	15,065,686	15,179,788
Barley	...	...	...	...	...	4,061,910	4,034,071
Oats	...	...	...	...	...	10,426,369	10,329,668
Potatoes	...	...	...	...	...	8,155,078	8,191,985

France.—A report published in the *Journal Officiel* (September 18th) gives the area and yield of wheat and rye in France as follows:—

Year.	Wheat.		Rye.	
	Area.	Yield.	Area.	Yield.
	Acres.	Bushels.	Acres.	Bushels.
1906	16,003,367	314,689,378	3,087,890	49,515,422
1905	16,078,986	325,085,337	3,135,541	56,320,220
1904	16,126,366	289,590,331	3,142,989	50,529,927
1903	16,002,458	353,060,207	3,204,151	56,159,922

A later report published on October 6th estimates that 1,746,100 acres of barley have yielded 35,860,000 bushels compared with 1,745,500 acres and 39,579,000 bushels in 1905, while 9,531,300 acres of oats have produced 250,467,000 bushels.

Hungary.—According to a memorandum received from H.M. Consul-General, summarizing a report by the Hungarian Minister of Agriculture, the results of this year's harvest have proved to be much more favourable than was anticipated. The yield of wheat comes to 102·3 million cwt., or 17·9 million cwt. more than in the preceding year. It is, in fact, the largest crop as yet produced in Hungary. The wheat crop in 1902 had always been considered a record one, but it is exceeded by this year's yield. An average crop of wheat is put at 78·7 million cwt. The greatest quantity of wheat has been produced where it is generally of the best quality, such as the region of the Theiss. This large harvest increases the possibilities of the export trade, as the quality of wheat both in Roumania and in Southern Russia is so inferior that dealers in Southern Germany have so far made no purchases in those two countries.

The result of this year's rye crop—27·6 million cwt.—has also been satisfactory. The yield of barley is put at 28·8 million cwt., which compares with the crops of 1902 and 1903. The oat crop comes to 25·0 million cwt. The maize crop is put at 80·4 million cwt., making the third best crop on record. Taking all cereals together, the harvest of 1906 is one of the best that has been known in Hungary. The potato crop has also been good—the production being 15·9 million cwt. larger than that of last year. Beans, tobacco, and beetroot all give results above the average, while other products, such as swedes, turnips, &c., are not below the average.

United States.—The October Crop Report published by the United States Department of Agriculture, as reported in *The Times*, shows that the average condition of maize on 1st October was 90·1, as compared with 89·2 on the same date in 1905, and 83·9 in 1904. The preliminary estimate of the yield per acre of spring wheat is 13·7 bushels, as against 14·7 bushels in 1905, and 12·7 bushels in the preceding year. With regard to oats, the preliminary returns indicate a crop of about 862,352,000 bushels, or an average of 31·2 bushels per acre. Last year the total yield was 939,332,000 bushels. The preliminary estimate of the yield of barley is 28·3 bushels per acre as against 26·7 last year.

Russia.—The Board have received through the Foreign Office a summary of an article in the official *Commercial and Industrial Gazette* of St. Petersburg, of September 8th, reporting on the general results of the Russian grain crops. Comparing them with the prospects a month earlier, a “considerable deterioration” is noted, due mainly to the cold, raw and rainy weather which set in during the reaping season in almost all parts of Russia. In consequence, not only in the eastern region, where previously the prospects were unfavourable, but also in the south, south-west, and west, a noticeable change for the worse ensued, chiefly from the point of view of the quality of the yield, but also at times as regards quantity. Here and there the crops have completely failed. As a result the general harvest of all grains in European Russia must be considered as unsatisfactory. Only winter wheat has given an average crop or a little above the average, and the remaining spring grains and rye are estimated to yield considerably below the average.

The same publication gives (September 9th) the following preliminary estimate of the approximate yield in the sixty-eight Governments of European Russia :—

Crop.				Average for 1900-1904.	1905.	Estimate of Crop of 1906.
				Cwts.	Cwts.	Cwts.
Winter wheat	...	...	...	100,671,000	117,148,000	106,714,000
Spring wheat	...	...	...	167,400,000	186,043,000	132,071,000
Rye...	...	...	...	435,311,000	350,582,000	327,857,000
Barley	...	...	...	127,414,000	144,771,000	113,143,000
Oats	...	...	...	232,907,000	242,582,000	199,607,000

Experiments have been carried out during the past six years at the Agricultural Experiment Station at Darmstadt with Lime Nitrogen (Kalkstickstoff) or Calcium Cyanamide, and Professor Paul Wagner* has recently issued a statement which summarizes the conclusions which have been arrived at up to the present. He says that in pot experiments, where the fertiliser is carefully mixed with soil of normal quality and employed in moderate quantities, satisfactory results will be obtained very closely approaching those from sulphate of ammonia. On soils of an acid character, and on sandy soils rich in humus but poor in lime the effect is small and uncertain.

Where lime nitrogen is broadcasted, or ploughed or harrowed into the surface, the effect under favourable conditions is equal to that of sulphate of ammonia. Under some circumstances the results obtained may be less than in the pot experiments. This may be due (1) to a loss of nitrogen owing to the ammonia passing off into the air ; (2) to the free ammonia interfering with the development of the plant ; or (3) to a small portion of the nitrogen being converted into dicyanamide, a combination which is injurious to plants. The second cause is more likely to be met with in sandy land and in dry weather.

The view that calcium cyanamide is unsuitable for use as a

* *Deutsche Land. Presse*, August 18th, 1906. For previous notices as to this manure, see *Journal*, March, 1904, p. 506, May, 1905, p. 101 April, 1906, p. 38 ; an July, 1906, p. 216

top dressing is not altogether correct. If applied in warm months, in May to oats and barley and in June and July to roots, its effect is usually small, but if applied in February to winter crops its action in many cases—perhaps as a rule—is satisfactory.

This fertiliser cannot be used with equal advantage for all crops. It acts badly as a rule on roots. The best and most certain results may probably be obtained by broadcasting in the spring on rye or wheat. A slight yellowing of the vegetation may result, but this usually disappears, and the effect approximates to that of sulphate of ammonia.

The pods of scarlet runners and French beans suffer most in this country from the attacks of this parasite. In America it is said to be parasitic on the living rind of cucumbers, vegetable marrows, water-melons and musk-melons.

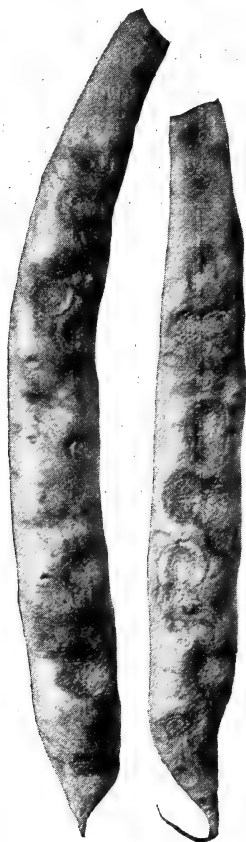
**Bean Pod
Canker.**

On the pods the first indication of the disease is the appearance of scattered small dark-coloured specks surrounded by a reddish line. These spots gradually increase in size, and often run into each other, forming irregularly-shaped patches which become sunk below the general level of the surface. In due course the sunken brown patches become more or less covered with a thin whitish crust, consisting of a dense mass of spores or reproductive bodies of the fungus. When mature these spores are carried by rain, insects, &c., and infect neighbouring plants.

Pods that are attacked when quite young often become variously bent and contorted. The parasite often passes quite through the pod and attacks the beans. If such infected beans are used for seed the crop shows the disease at an early stage of growth, and is killed before the flowering season is reached.

Although the appearance of the disease on the pods is accepted as the first evidence of its existence by the gardener, nevertheless it usually appears first on the stem, where it forms brownish sunken patches. If such patches are confined to one side of the stem the plant is not killed outright, and the injury

may escape notice ; on the other hand, when a diseased patch girdles the stem, the portion above the wound withers and dies. In some instances the leaves are also attacked, and the diseased portions soon become dry and drop out, leaving irregular holes usually attributed to the ravages of insects.



BEAN POD CANKER.

As a rule the pods are infected by spores produced on the stem or leaves, consequently much depends on dealing with the disease on its first appearance.

Preventive Measures.—Bordeaux mixture half the normal strength should be used until the pods are set, after which a solution of potassium sulphide—one ounce dissolved in four gallons of water, should take its place. Even this fungicide should be discontinued when the pods are about half-grown.

The evidence as to the value of the rook as a bird useful to agriculture was discussed in a report by Dr. Schleh, of Münster, which was summarized in this

Food of Rooks. *Journal* in January, 1905. A later report on the same subject by Dr. Hollrung,* of Halle, affords an opportunity of estimating the value of the rook (*Corvus frugilegus*) on the basis of post-mortem examinations made during the past eleven years (1895-1905). In this period 4,030 rooks were examined, and the various classes of food consumed by them differentiated and identified as nearly as possible. Cereal grains, seeds of other cultivated crops, weeds, and various vegetable remains, together with remains of birds, mice, hares, moles, &c., molluscs, insects, myriapoda, spiders, and so forth, all these were found in numerous instances, insects and vegetable remains, however, being by far the most common.

The rook is practically omnivorous, though the food taken may be largely influenced by geographical position, weather, time of year, proximity to lakes, ponds, meadows, &c. In 1902 the caterpillars of the winter moth (*Cheimatobia brumata*) were very plentiful, and in consequence a large number (5,583) were found in the rooks then examined. In spring when the wireworm was attacking the sprouting corn at the surface of the ground many were eaten by the rooks, but in summer when the wireworms had left the surface few were found. In the month of March 100 rooks were found to have taken 102 wireworms, whereas 100 rooks captured between April and September had only taken 40 wireworms. Large numbers of chafer beetles and their larvæ, wireworms and elater beetles, weevils, caterpillars, and daddy-long-legs were taken by the rooks. Against this, however, must be put many thousand grains of wheat, barley, and oats, and a considerable number of grains of rye, maize, and buckwheat, as well as potatoes and other crops.

For purposes of comparison, and omitting the less important items on both sides, we may take the two following tables,

* *Landwirtschaftliche Jahrbücher: Beiträge zur Bewertung der Saatkrähe auf Grund von 11-jährigen Magenuntersuchungen*, von Prof. Dr. M. Hollrung, 1906.

the first containing grain, &c., eaten by the rooks, and the second the harmful insects they devoured :—

I. GRAIN &C. TAKEN BY 4,030 ROOKS.

Sprouted :—

Wheat	...	...	...	...	15,578	grains.
Barley	...	...	...	...	10,465	„
Oats	...	...	...	...	12,787	„
Maize	...	...	...	...	987	„
Buckwheat...	...	...	...	...	1,777	„
Potatoes	...	...	...	...	587	

Unsprouted :—

Barley	...	...	...	...	247	grains.
Maize	...	...	...	...	40	„
Rye...	...	...	...	...	358	„

II. HARMFUL INSECTS TAKEN BY 4,030 ROOKS.

<i>Me'lontha vu'garis</i> (cockchafer) beetles	...	2,222
„ „ white grubs	...	2,264
<i>Elater</i> or "click" beetles	...	2,307
„ larvæ (wireworms)	...	1,589
Weevils (total)	...	14,710
Caterpillars (total)	...	9,126
<i>Tipula</i> larvæ (leather jackets)	...	3,411
<i>Cassida</i> (tortoise beetle)...	...	2,062
<i>Chrysomelidæ</i> , sp. (leaf beetles), total	...	2,113
<i>Phyllopertha</i> , <i>Anisoplia</i> , <i>Hoplia</i>	...	1,717
<i>Silpha</i> , sp. (burying or carrion beetles)...	...	984
<i>Bibio</i> , grubs (hair gnats)	...	406
<i>Zabrus gibbus</i> (corn ground beetle)	...	86

It may be remarked that the totals of these two tables show that against the 42,826 grains of corn and potatoes taken we have to place to the credit of the rooks the destruction of no less than 43,997 insects harmful to agriculture. Considering the cockchafers alone, Dr. Hollrung suggests that if the 2,222 beetles were equally divided as regards sex, and the females laid their ordinary quota of 60–70 eggs, a total of 66,660 eggs would be laid. In a normal season perhaps one-half would hatch, thus giving rise to 33,330 white grubs. It is considered that ten cereal plants form a low estimate of the plants destroyed by each grub per annum. This would mean that the progeny of the 2,222 beetles devoured by the rooks would have destroyed 333,300 cereal plants per annum. But the grubs live about three years in the soil, during the last two of which they are very destructive to living roots, &c. Supposing in the second year 50 per cent. of the larvæ are killed or die from various causes, there will still be 16,665 larvæ which will destroy a

further 166,650 plants in the third year, making a total of half a million. The rooks also destroyed 2,264 white grubs, representing on the same basis a further 22,640 plants. Against all this, which may be assumed to be saved by the death of the chafer beetles, is to be placed the total of 39,077 cereal plants (wheat, barley, oats) actually destroyed by the rooks. Similar lessons are drawn by Dr. Hollrung from the destruction by the rooks of other insect pests like wireworms.

From these investigations Dr. Hollrung arrives at the following conclusions :—(1) Rooks are omnivorous, taking seeds, animals, insects, and all kinds of refuse ; (2) they are not particular as to their feeding places, visiting alike freshly-ploughed fields, orchards, dung heaps, open potato clamps, corn ricks, &c. ; (3) they are harmful to game-preserving, although they are frequently blamed for damage done by other species of *Corvidæ* ; (4) the cultivated crops chiefly damaged are cereals (including maize), certain papilionaceous plants, buckwheat, and potatoes ; (5) the chief insect pests destroyed by them are cockchafers and their grubs, wireworms and the click beetles, dung beetles, several species of weevils, tortoise or helmet beetles, and many kinds of caterpillars ; (6) in the neighbourhood of rookeries the harm done easily outweighs the good ; where rooks occur in large flocks excess of damage is to be feared, especially at times of the year when insects are scarce ; when they are few in number or widely dispersed, and where harmful insects abound rooks are undoubtedly useful ; (7) the extermination of rooks is under no circumstances justifiable, for it is clearly proved that they destroy insect pests harmful to crops, including those which are with difficulty reached by artificial means ; (8) the reduction of the number of rooks to a given limit may be carried out with certainty by shooting the young before they are fully fledged, or by destroying a number of the nests by means of explosive bullets ; (9) lastly, farmers who suffer much harm from the attacks of rooks are advised to form a "Society for Insurance against Damage by Rooks."

As regards reducing the number of rooks in a given district the harm done will only be transferred to another locality unless all farmers take steps energetically and at the same

time, one farmer's efforts merely sufficing to drive the birds to other farms. Rookeries should not be permitted to become too extensive or too strong in numbers.

It will be remembered that the Board recently suggested the desirability of keeping the number of rooks in this country within limits (see *Journal*, May, 1906, and July, 1906).

With reference to the question of the extent to which the percentage of dry matter in mangolds and swedes is indicative of the feeding value,* some experiments

Feeding Value of Mangolds.

have been carried out at the Midland Dairy Institute with Prize Winner Yellow Globe and Golden Tankard mangolds. Trials had already shown that the percentage of dry matter in Yellow Globes was 9.68, and in Golden Tankards 13.00, and assuming that a hundred-weight of dry matter in mangolds to be worth 6s. 9d., Golden Tendars would be worth 4s. 6d. per ton more than Yellow Globes. The object of the experiment was, therefore, to ascertain whether mangolds containing a high percentage of dry matter possess any superiority over mangolds containing a low percentage of dry matter, and to investigate the relationship existing between feeding value and dry matter for milk production when both kinds were fed in equal quantities. Two lots of three cows each were tested, each lot being as nearly as possible identical as regards period of lactation, age, number of calves and temperament, so that any disturbing factors were reduced to a minimum. Further, to lessen the risk of irregularities in the experiment, due to feeding, &c., it was decided to put the lots alternately, for three weeks, on each class of root. Thus, whilst Lot 1 received Golden Tankards Lot 2 was getting Yellow Globes, and *vice versa*. The cows were cross-bred Shorthorns. The experiment lasted from February 7th to March 21st. The foods consisted of a mixture based upon the ration which was fed to the herd in the ordinary way, so that there was little change in the dietary when the

* *Journal*, September, 1905, p. 353; August, 1906, p. 282.

experiment commenced ; it was made up as follows :—5 lb. cake, 5 lb. mixed meal, 4 lb. straw chaff, 14 lb. hay, and 55 lb. mangolds.

The result of the trial showed that the cows receiving Golden Tankards maintained their yield for the three weeks, but there was a distinct fall as soon as they were put on the Prize Winner mangolds. On the other hand, Lot 2 commenced by getting Prize Winner, and there was little alteration in the yields of milk from the start to the end of the third week. Tankards then taking the place of the Yellow Globes, a slight increase was registered, and this was maintained till the end of the sixth week. The total return obtained from feeding with Golden Tankards was 2,970 lb., and from the Yellow Globes 2,863 lb. of milk. There was thus an increase in favour of the Tankard variety of 107 lb. This quantity of milk, at 8d. per gallon, is worth 7s., and was obtained by feeding $3\frac{1}{10}$ tons of roots. If this increased yield is apportioned to the mangolds, it shows that Tankards were worth 2s. 3d. per ton more than the Globes.

When, however, the milk was tested for quality, that yielded by the cows fed on the Prize Winner Yellow Globes showed, on the average, 3·47 per cent. butter-fat in the morning, and 4·25 per cent. in the evening, whilst the larger yield from Golden Tankards was somewhat poorer in composition, viz., 3·38 per cent. butter-fat in the morning's milk, and 4·08 per cent. in that of the evening. In consequence, the total amount of butter-fat produced was about the same in both lots.

The cows in both lots gained a little in weight, but those fed on the Tankard variety gave the best results.

In a recent number of this *Journal* (October, 1905) some account was given of the measures taken in Germany to promote and encourage the industry of cattle-breeding. In the case of horse-breeding, it appears from a Foreign Office Report on the State of Agriculture in the Rhenish province that considerable assistance is afforded to this industry also through the Provincial Chambers of Agriculture. In that

province regulations are in force requiring the licensing of stallions and providing for the appointment of district commissions authorised to issue licenses. These regulations are given below, and it is stated that they are enforced by the State and are very strictly adhered to:—

Sec. 1.—Only such stallions may serve mares as are approved by the State and have received a serving license, which has to be renewed annually. The following are excluded and need not have any license:—(a) the sires owned by the State; (b) thoroughbred sires charging a fee of £2 10s.; (c) sires owned by private owners and only used to serve the mares belonging to that same individual owner of the sire; (d) sires belonging to horse-breeding associations and subsidised by the Government and still under the supervision of the State officials.

Secs. 2 and 3.—The province is divided into three districts, and each district has a breeding commission, which consists of:—(1) The director of the royal stud at Wickrath; (2) an expert who is appointed by the Chamber of Agriculture for a period of six years for the whole province; (3) an expert appointed by the province for six years; (4) the president of the horse shows; (5) an expert appointed by the Chamber of Agriculture for six years for the particular district; (6) a veterinary surgeon appointed by the provincial authorities. All appointments have their substitutes. A chairman is appointed by the combined commission. The commission has annually to appoint and fix days in every district for shows and for issuing licenses.

Sec. 4.—Only such sires get a serving license as are approved by the commission appointed; they must invariably belong to some recognized breeds.

Sec. 5.—The commission's decisions are absolute; the votes are taken by secret ballot. In case of equal votes the chairman's vote decides the point in question. Every sire receiving a serving license is registered and minutely described; the places where the stallion may serve are fixed, the name of the owner is stated, and registers of the mares served have to be kept by the responsible person. Besides the sire's owner and the stallion's description the amount of the fee charged for service is fixed and made public.

Sec. 6.—When a stallion has received a serving license the owner is obliged to renew his license every year ; the license is only given for twelve months. If the license is not renewed the sire is not allowed to be used for serving purposes again.

Sec. 7.—The owner of a serving stallion is obliged to keep a register of the mares served and an accurate description of them has to be entered ; these lists are periodically checked by the authorities.

Sec. 8.—Every owner of a sire who shows him as a candidate for a license pays a fee to cover the costs of the show and commission expenses.

Sec. 9.—The owner of a sire not having a license and using the stallion for breeding purposes is fined £1 10s. for every individual case, and the owner of the mare is fined 15s. Should it be proved that the registers are not properly kept according to instructions the owner is fined 15s. in each case.

Horse-breeding associations exist which are subsidised by the Government through the Chamber of Agriculture, and these purchase good brood mares at reasonable prices from the best breeders. They encourage horse-breeding among the smaller farmers and assist them financially, as well as with advice. There seems to be a good demand for horses. The army requires a large number for its artillery and cavalry. At a recent show of horses the Government bought a large number from farmers ; the average price was £62 10s. ; the prices varied from £50 to £70 chiefly for rising four-year-olds. The great iron industries and coal-mines also require a very large supply of horses, and for these purchasers the farmers breed the Belgian class. The associations buy annually about twenty Belgian mares of the very best blood and sell them to their members. At the last sale £50 to £90 were paid for 1½ to 2½ year olds.

The Board have received through the Foreign Office the following information relating to the importation of live stock into Holland.

**Live Stock
Import Regula-
tions.—Holland.***

The importation of animals into the Netherlands is regulated by the Royal Decrees of 8th December, 1870, and of 4th August, 1888. The former prohibits the importation from other countries of cattle, sheep, and goats, and of some animal products which might introduce contagious diseases. The second Decree prohibits the importation and transit of pigs and of some slaughter house products. The Government have power, however, to make exceptions in special circumstances, provided due precautions are taken against the introduction of contagion. Such special permits can only be obtained by application to the Minister of Agriculture. The application must be accompanied by two certificates, one from the owner of the animal, giving particulars as to its age, marks, and breed, name of purchaser and destination, and one from a duly qualified veterinary surgeon.

The latter certificate should state that the animal has been examined and found free from disease, and in the case of cattle that there has been no infectious pleuro-pneumonia for 120 days and no cattle-plague or foot-and-mouth disease on the premises for the last six weeks; in the case of sheep that for the last six weeks there has been no cattle-plague, foot-and-mouth disease, sheep pox or foot-rot; in the case of swine that no foot-and-mouth disease and no swine fever has existed on the premises for the last six weeks.

The importation into and transit through the Netherlands of solipedes from Great Britain and Ireland is forbidden, but this prohibition is not applicable as far as importation is concerned to horses bought by the State for purposes of the Army, or to horses brought direct by ship to Amsterdam or Rotter-

* Live stock import regulations have been published in this *Journal* for the following countries:—United States, June, 1903, and Sept., 1906; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; Canada, March, 1905; New South Wales, April, 1905; Germany, May, 1905; New Zealand, June, 1905; South Australia, July, 1905; France, August, 1905; Belgium, Sept., 1905; Uruguay, Oct., 1905; Victoria, Nov., 1905; Spain, Dec., 1905; Queensland, Jan., 1906; Western Australia, Feb., 1906; Tasmania, March, 1906; Transvaal, June, 1906; and Ceylon and Cape Colony, Sept. 1906.

dam, which are found after an examination of the district veterinary surgeon not to be suffering from glanders, and with respect to which certain regulations, summarized below, are observed.

Horses which are intended for slaughter must be conveyed as soon as possible after arrival to the slaughter-house, and there be slaughtered within eight days. Slaughter-houses for horses exist at Amsterdam, Rotterdam, Leiden, Nymwegen, and Utrecht, but horses will not be allowed to be sent to the three latter places unless the veterinary surgeon certifies that they are free from glanders, strangles, pink eye and other diseases, and are fit to be transported by rail. (See Regulations published in *Nederlandsche Staatscourant*, of 16th Aug., 1906.)

Other horses must be inoculated with mallein either at the place of arrival or at the place of destination, under the superintendence of the district veterinary surgeon, and at the cost of the owners. The district veterinary surgeon is empowered to grant exemption from this mallein test in special cases, and provided that an official declaration from the authority of the place of origin, issued within the last eight days, is given him showing (1) that the animals, whose age and description are to be given, have remained on the premises during the last twenty days and that no case of glanders has occurred there in the last three months, and (2) giving the route and method of conveyance. In such a case the owner is bound to keep the animals for a period not exceeding three months, apart from all other animals of the same species till they have been again examined by the district veterinary surgeon and declared healthy.

The importation of solipedes not intended for slaughter, carried direct by ship to Flushing, is permitted under similar conditions. The through transit is permitted of solipedes which are conveyed immediately after disembarkation apart from other cattle, by railway, without untrucking, in special locked and sealed waggons; but exemption can be obtained from the district veterinary surgeon for horses of such value and quality that from the nature of things no danger of infection is likely to arise.

In regard to the importation of live stock into Malta, it appears that Government Notice No. 86, dated April 19th,

**Live Stock Im-
port Regula-
tions—Malta.**

1904, has been cancelled, and has been replaced by the following regulations:—Horses, cattle, sheep, and pigs must be accompanied by a certificate, signed by the local authority, stating the number of cases of infectious or contagious diseases of animals of the same species which have been officially returned both at the place of origin and of embarkation during the three months preceding the date of embarkation, and the number and species of the animals. The consignor must, before embarking the animals, obtain a permit to import them.

Horses are to be quarantined and submitted to the mallein test, if this be deemed necessary. They are not to be released until the veterinary surgeon declares them to be healthy.

[Bulletin Mensuel July, 1906.]

Surprise Butter Competitions have been held by the Department of Agriculture for Ireland during the past three years.

**Surprise Butter
Competitions
in Ireland.**

The purpose of the competitions is explained as follows:—

Object of the Competitions.—"The object of these competitions is to induce creamery managers and others engaged in butter-making to give increased attention to every detail in the making and packing of butter, and particularly to cleanliness in every stage of the work. The reputation of Irish Lutter must depend on the degree in which these two essentials, viz., cleanliness and attention to details, are possessed by Irish butter-makers. But unless interest in the work can be increased and sustained, and unless those engaged in the industry bring into the work a certain amount of enthusiasm, accompanied by a desire and a determination to excel, the qualities which mark the successful Lutter-maker will not be perpetuated, and the possibilities of Ireland as a butter producer cannot be realised to the full. Fortunately, butter-making is an occupation which becomes engrossingly interesting to those who have studied the numerous scientific problems which it presents to the thinking mind. The courses of instruction for creamery managers have been instrumental in arousing interest in the scientific side of dairying, and it is hoped that these competitions may serve the further useful purpose of stimulating many creamery managers to greater sustained practical efficiency. They certainly should set up a standard of comparison by means of which butter-makers will be able to measure their progress towards perfection."

Manner of Conducting the Competitions.—The butter exhibited is called up for the competitions by telegrams despatched by the

Department on the morning of the day on which the exhibits must be forwarded. The competitors are unaware of the dates on which the telegrams are to be despatched. They may receive a telegram on any date during the season. The constant daily attention which a competitor must accordingly give to his work is one of the principal advantages which accrue from the system of surprise competitions. In view of the system of notifying creameries by telegram no special preparation can be made and the butter exhibited represents what is shipped to the British market, and not a parcel of butter specially prepared from selected milk or from cream ripened and churned under special conditions. It is, therefore, the commercial butter that is judged, not what is so often called "Show Butter."

In order that the butter may be tested on a strictly commercial basis it is stored, on its receipt in Dublin, under ordinary conditions for a period of six to ten days. At the expiration of this period the butter is examined and judged. Any faults latent in the butter, due to defects in the methods of manufacture or the acceptance of bad raw material, will have generally developed during the waiting period, and the judges see the butter as it would reach the consumer, not as it leaves the creamery.

Judging.—The method of judging hitherto adopted is as follows:—Four judges, of whom one is always an Irish buyer resident in Ireland, first examine and score the butter for flavour, texture and colour. There is no discussion between the judges during this scoring, so that the unbiassed opinion of each individual judge is obtained. The butter is then turned out of the packages and the judges jointly score the samples for packing and finish.

As the greater part of Irish butter is sold in Great Britain, three of the judges are chosen from important butter distributing centres, being selected to represent the buyers whom it should be the object of the proprietors and managers of creameries to please. The judges represent different districts, so that the butter is not scored from a local point of view. Colour being one of the characteristics of butter which may render it suitable or unsuitable for a particular market, the judges are requested to eliminate the question of *depth* of colour. They deduct points only when the colour is dull, muddy, mottled, or streaky, so that

an exhibitor making a pale butter suitable for a North of England market is not handicapped by the butter being submitted to a judge from a district where a deeper colour is in request.

The following is the scale of points adopted as a basis in judging :—Flavour, 60; texture, 25; colour, 5; packing and finish, 10; total, 100 points. The full marks represent what the judges consider the best butter, from any source whatever, arriving in the markets of Great Britain. No exhibit is entitled to full marks unless, in the opinion of each of the judges, it equals this butter in every respect. In the scoring, deductions are made for a defect under any heading in proportion as the butter suffers in monetary value from the defect. Any reduction of the commercial value of a butter is thus expressed as nearly as possible in the marks.

In addition to the marks awarded, notes are frequently added explaining, where possible, why a butter is "scored down" under any particular head, *e.g.*, flavour, texture, &c.

Since 1903 the Department have invited a number of creamery managers to attend at various competitions, their expenses being paid by the Department. They were by this means afforded an opportunity of discussing with the judges, on the day of the competition, the defects and improvements in the exhibits generally. Next day they were permitted to examine personally their own exhibits, see their scores, and compare them with the other samples, under the direction of one of the Department's Inspectors, by whom the defects noticed in the exhibits and the steps to be taken to bring about an improvement were explained in detail.

The Board of Agriculture and Fisheries recently had occasion to ask the local authorities in Great Britain for a return of all

**Number of Mar-
garine Factories
and Butter
Factories in
Great Britain.**

the manufactories of margarine, that is, places in which margarine is actually made, and opportunity was taken at the same time to ask them to supply a list of butter factories in which butter is blended, re-worked, or treated by any process, as distinguished from creameries or dairies where butter is churned

Statement of the Returns received by the Board of Agriculture and Fisheries up to 16th August, 1905, from local authorities in Great Britain, shewing the number of (1) Margarine Manufactories, and (2) Butter Factories where butter is blended, re-worked, or treated by any process, as distinguished from creameries or dairies where butter is churned from milk or cream :—

					Margarine Manufactories.	Butter Factories.
COUNTY :						
Berkshire ...	...	...	...	...	—	1
Carmarthen ...	...	...	...	...	—	12
Cumberland ...	...	...	...	...	—	7
Dorset ...	...	...	...	...	—	9
Gloucestershire ...	...	...	...	...	—	5
Hampshire ...	...	...	...	...	—	1
Lincolnshire (Kesteven)...	...	...	...	...	—	1
Middlesex ...	...	...	...	...	2	—
Pembrokeshire ...	...	...	...	...	—	4
Somerset ...	...	...	...	...	—	13
Surrey ...	...	...	...	...	—	1
Sussex, East ...	...	...	...	...	1	—
York (West Riding)	...	...	...	...	—	1
Warwickshire ...	...	...	...	...	—	1
Westmorland ...	...	...	...	...	—	5
Wilts ...	...	...	...	...	—	1
BOROUGH :						
Battersea ...	...	...	...	...	—	2
Bermondsey ...	...	...	...	...	—	2
Birkenhead ...	...	...	...	...	1	1
Birmingham ...	...	...	...	...	1	2
Bridgwater ...	...	...	...	...	1	—
Camberwell ...	...	...	...	...	—	1
Devonport ...	...	...	...	...	—	4
Finsbury ...	...	...	...	...	—	3
Greenwich ...	...	...	...	...	1	—
Hove ...	...	...	...	...	1	—
Hyde ...	...	...	...	...	1	—
Ipswich ...	...	...	...	...	—	1
Liverpool ...	...	...	...	...	2	—
Nottingham ...	...	...	...	...	—	2
Poplar ...	...	...	...	...	8	2
Reading ...	...	...	...	...	—	2
St. Marylebone ...	...	...	...	...	—	1
Southampton ...	...	...	...	...	1	—
Stepney ...	...	...	...	...	—	3
Warrington ...	...	...	...	...	1	—
					(2) <i>Scotland.</i>	
COUNTY :						
Aberdeenshire ...	...	...	...	...	—	2
Ayrshire ...	...	...	...	...	2	—
Kirkcudbright ...	...	...	...	...	1	—
Lanarkshire ...	...	...	...	...	1	—
Midlothian ...	...	...	...	...	1	—
Wigtownshire ...	...	...	...	...	2	—
BOROUGH :						
Aberdeen ...	...	...	...	...	2	2
Glasgow ...	...	...	...	...	2	—
Leith ...	...	...	...	...	1	—

from milk or cream. The replies which have been received enable the statement, shown on the page preceding, to be prepared :—

It appears from this that there are approximately 21 margarine factories in England, and 12 in Scotland ; in the case of butter factories there were 88 in England, and 4 in Scotland. The replies received from the remaining local authorities returned neither margarine nor butter factories. In a few instances no returns have been received.

**Cold Curing
of Cheese.**

In England it is usually considered that the temperature of a cheese-ripening room should be about 65 deg. F. ; in the United States, on the other hand, as the result of a number of experiments carried out during the past ten years, there is a general tendency in the principal cheese-making districts to adopt a temperature of 40 deg. F. as a maximum. The practice of ripening cheese in warm rooms develops flavour, but consumers in the United States are found at the present time to prefer a very mild-flavoured cheese, so that the new method meets the market demand. There seems, however, to have been a modification in the public taste in this respect which may not improbably be attributable to the introduction of the new system.

Detailed accounts of the investigations which have been and are being conducted on the subject of cold curing appear in several recent publications of the United States Department of Agriculture,* and seem to show on the whole that the loss of moisture is less at low temperatures, that the commercial quality of the cheese is better, and that it can be kept for a long time without injury.

The first work to determine the influence of lower temperatures on the ripening of cheese was undertaken by the Wisconsin Experiment Station in 1895. In this experiment cheese was cured at three temperatures—50 deg., 60 deg. to 65 deg., and 85 deg. F., and it was found that the cheese cured at 50 deg., though requiring a much longer time, was equally good in quality.

* "The Cold Curing of Cheese," Bull. 49; "The Cold Curing of American Cheese," Bull. 85; and "The Cold Storage of Cheese," Bull. 83, Bureau of Animal Industry.

This result pointed to the fact that the curing of cheese was due at least partially to other agencies than bacteria, and led to the discovery of galactase—an enzyme natural to milk, which has the power of breaking down the casein. Subsequently, five temperatures were employed, viz., 15 deg., 33 deg., 40 deg., 50 deg. and 60 deg. F., and it was found that 40 deg. and 50 deg. F. gave the best result according to the market standard at that time. In another series cheese cured at 60 deg. F. was stated to be superior in flavour to that cured at five lower temperatures at some periods of its ripening. In summing up the work done at this station, however, attention was called to the fact that the cheese cured in cold storage was much more uniform in quality than that cured under the old conditions. It was stated that most factories suffered considerable loss from the rejection of cheese because of its inferior quality. It was pointed out that such losses were in part due to the use of tainted milk and to variation in manufacturing details, but in a large measure they might be ascribed to variation in curing conditions due to inefficient methods, and of these conditions temperature was by far the most important. With cheese cured at lower temperatures the effect of these factors was much modified, with reference not only to the conditions which occurred in the curing, but also to the variations in conditions of manufacture. The result showed that with a lower temperature the quality of the cheese is more uniform, and the product ought naturally to bring a somewhat higher price, and be more sought after by the buyer. A recommendation was also made that the cheese should be put into cold storage direct from the hoop.

Cold storage warehouses are found in many of the towns in the cheese districts of Wisconsin, and the practice now is to place cheese in storage within two weeks or less after it is made. Curing in the cheese factory is said to be a thing of the past in all places where a storage warehouse is at all accessible.

In Canada experiments have been carried out by the Ontario Agricultural College with approximately similar results, but presumably, owing to the fact that cold storage warehouses are less general than in the United States, the erection of cool curing rooms on a co-operative basis has been recommended. For these rooms a temperature of 50 deg. was suggested as being less ex-

two weeks did not appear in cheese stored directly it was made ; and in the same way where cheese was allowed to develop too much acid, it was evident that the quicker the cheese was placed in storage and the lower the temperature the better the result.

Effect of Cold Storage on Weight.—Another series of experiments dealt with the question of how different temperatures affect the weight and quality of cheese stored for considerable periods. It was shown that the storage of cheese at a temperature near freezing point greatly reduces the loss due to shrinkage in weight as compared with that which occurs at higher temperatures, that such loss is still further prevented by covering cheese with paraffin wax, and that the combination of these two conditions reduces the shrinkage to a minimum.

The use of Sussex Ground Oats, both for rearing and fattening poultry, has been one of the chief factors in the successful poultry production of the South-East, and has produced a considerable demand for this material not only here but in other districts. Millers in various parts of Great Britain and Ireland have endeavoured, more or less successfully, to meet the requirements ; and, whereas the trade was formerly practically a monopoly in the hands of the small millers scattered throughout East Sussex and parts of Kent, several large millers have recently set up the requisite plant, and by the use of steam have considerably added to the previous limited and irregular output of the wind and water mills.

The use of millstones is, however, just as necessary as of yore for the production of genuine Sussex Ground Oats, which are, in fact, good heavy oats, entirely ground, including the husk, to a meal almost as smooth and fine in texture as ordinary flour. Oatmeal is a different preparation, and is unsuitable for the purpose ; and the so-called "ground oats," frequently used in ignorance by poultry-keepers (other than those of the South-East), are of a coarser texture, and would be described by the professional fattener as too "hucky." Sussex poultrymen are very particular that their ground oats shall be free from

unground husk and any extraneous matter, it being found that a coarse quality is liable to cause digestive disorders in young chicks, and that the husky portions cannot be digested even by adult fowls, so that much of the feeding-value is lost. It is the Sussex method of grinding by means of specially dressed stones that (by the utilization of the whole grain) produces a poultry food so evenly balanced in itself ; its own ratio of flesh forming to that of heat and energy producing material being, on an average, that of one to four and a half, which is as near as possible to theoretical perfection. Long use in Sussex has proved the value of this particular meal in the production of fat and lean in desirable proportions ; and that the flesh of fowls fed with it is white in colour and excellent in flavour.

It may be stated that, as a matter of fact, Sussex Ground Oats are very seldom pure oats, it being found necessary to assist the grinding process by a small admixture of another grain ; in the majority of cases, barley is used for the purpose in the proportion of about one sack of barley to ten sacks of oats. The proportion of barley is sufficiently small to make it quite unobjectionable even for the feeding of young chicks.

The grinding stones, which generally measure about 4 ft. in diameter, are made from Derbyshire Peak stone ; they weigh about 1 ton each, and when in constant use last from a year to a year and a half. The grinding surface is prepared by furrowing, the furrows being cut perpendicularly on one side and sloping on the other ; the prepared surface being very similar to that which was, until lately, used generally for grinding corn, but with the addition of pitting on the flat sections between the furrows. The tool used for the dressing is a sharp, hard, steel, short-handled pick, called a thrift. A pair of stones being both furrowed alike, the sharp edges of the grooves on the one come against those on the other, and cut the grain, the pitting assisting in producing the fineness of the ground product.

The process is expensive because it is slow, and the stones require to be frequently dressed. The stones are run at an average of about one hundred and forty revolutions per minute, and it is maintained that the high temperature produced in the grinding has a direct bearing upon the peculiar properties of the meal. The process of grinding consists simply in a pre-

liminary cleaning of the oats, which are then fed to the hoppers at the rate of about four bushels per hour, and passing through the hole in the centre of the upper millstone come between the two, where they are ground and thrown out at the sides as meal by centrifugal force.

Although the process is so simple, yet as it depends upon the use of specially and frequently dressed stones, it is slow and laborious: Sussex Ground Oats are, therefore, relatively expensive, but the fatteners of Sussex consider no other meal or mixture so economical, even at a considerably lower price.

Sussex Ground Oats measure four bushels to the sack, but the weight of the bushel varies—being weighed as 30 lb. in the Heathfield district, and as 32 lb. in the Uckfield district. The average local price ranges from £8 to £9 per ton. Many of the large chicken fatteners use as much as one hundred sacks per week.

J. W. HURST.

The Departmental Committee appointed by the Board of Agriculture to inquire into the fruit industry refer in their

**Establishment
of Markets
for Fruit.**

Report to the question of the provision of markets, and make three recommendations:

(1) that it is desirable that more local markets, similar to that of Kew Bridge, be established in the suburbs of London; (2) that as regards the large distributing markets in provincial centres, it is desirable that certain of these be extended and improved; and (3) that the provision of retail markets in many country towns is urgently needed, and that very good results would be likely to follow if the Councils of other towns followed the example set by Hereford in establishing a market under their own authority.

The origin of the Kew Bridge Market, mentioned above, shows that the formation of a fresh market at a new centre may supply a decided local want, and create a fresh demand. The Kew or Brentford Market originated six or seven years ago. The carters on the journey from the country to Covent Garden used to stop at Kew Bridge to bait their horses. The practice arose of selling some of the goods while waiting. An informal

market grew out of this, which the proprietors of the district converted into a formal one, and which has now become a market of considerable importance.

The Committee say it can scarcely be doubted that if a similar opportunity for starting a market occurred in other suburbs of London, a similar demand for fruit would be found to exist there, or would be created by the opportunity afforded.

With regard to the extension of provincial markets, it is pointed out that there are towns of 100,000 inhabitants which have no markets deserving the name. The multiplication of large provincial markets would, no doubt, be of much importance in relieving gluts to the great advantage of growers. Two instances are quoted in illustration of the development of provincial markets, viz., Birmingham and Hereford. Thirty years ago the former was quite small, but it has been repeatedly enlarged, and has now become an important distributing centre. That at Hereford has proved of immense importance to the growers, who there find customers for their produce in bulk, and who, according to Mr. Meats, the salesman for the Corporation, make double the prices which they used to do before the market was started. This market was but little appreciated at first, but is now recognized to be of much importance to the county. It is managed for the Corporation by a committee, and the committee supply the growers with boxes for their produce at a low charge.

In regard to the small retail markets in country towns, the Committee observe that there appears to be room for much improvement. These markets are in many cases held in the open streets, where the sellers are fully exposed to the weather, and where, as might be naturally expected, no good produce or well-to-do growers are likely to be found. If these markets were suitably covered, a considerable increase in trade would doubtless result, for the small grower cannot send to large markets with much chance of good profit, owing to the heavier rates on small quantities and to the fact that small consignments do not admit of his name getting known on the market. His proper market is the local market. A favourable instance of a retail local market, which has been mentioned to the Committee, is that of Barnstaple, to which the farmers in

the neighbourhood send their produce every week, and to which the whole country-side resorts to obtain the week's provisions.

As regards the provision of new markets outside London, it is to be observed that the Councils of Boroughs and all other Urban Districts are empowered under Sections 166 and 167 of the Public Health Act, 1875, to establish, regulate, and carry on markets subject to the consent of any person possessed of market rights, powers or privileges.

It is also open to local authorities to obtain market powers or extension of market powers by means of Local Acts, and the Board are informed by the Local Government Board that cases of the kind are not infrequent. An example will be found in the Dartford Improvement Act, 1902, and as regards the metropolis, attention may be directed to the City of London (Spitalfields Market) Act, 1902, Section 20 of which empowers the Stepney Borough Council to acquire by sale or lease the Spitalfields Market after its acquisition by the Corporation of the City of London.

According to Government Notice No. 141, dated June 21st, 1906, no person may introduce into Southern Rhodesia any

**Plant Import
Regulations—
Rhodesia.***

plant from places beyond South Africa except by post, or through the following sea-ports :—Beira, Lorenzo Marques, Durban, East London, Port Elizabeth, Mossel Bay, and Cape Town, or such ports of entry as the Administrator may allow by special permit. Amongst articles forbidden entry may be mentioned any eucalyptus, acacia, or coniferous plant, any stone fruit tree, or any portion thereof, grown in any part of North America where peach yellows exist, and live peach stones.

Stocks of pear, plum, apricot, cherry, mango, persimmon, or apple stocks resistant to the attack of woolly aphis (*Schizoneura lanigera*) may be imported in bulk only, that is to say in quantities of not less than 1,000. Flowering or ornamental

* Previous notes as to plants import regulations have appeared in this *Journal* as follows :—Germany, September, 1903; Cape Colony, October, 1904; Transvaal, February, 1905; New Zealand, August, 1904, and June, 1906; Natal, September, 1905; and Western Australia, June, 1906.

plants and other trees and fruit-bearing plants may be imported under certain conditions by special permission of the Secretary for Agriculture. The full text of the present Government Notice is published in the *Rhodesian Agricultural Journal* (August, 1906), and may be seen at the offices of the Board.

The International Convention for the Protection of Birds Useful to Agriculture has drawn up a list in which it distinguishes between those species which may in general be considered useful or harmful to agriculture.* The most important of these are given below.

Birds Useful and Injurious to Agriculture.

Useful Birds.—Certain species of owls (*Surnia*, *Athene*, *Glaucidium*, *Syrnium*); barn owl (*Strix flammea*, L.); the short and long-eared owls (*Otus brachyotus* and *O. vulgaris*); Scop's owl (*Scop's Aldrovandi*, Flem.); all species of woodpeckers (*Picus*, *Gecinus*, &c.); roller (*Coracias garrula*); hoopoe (*Upupa epops*); tree creepers and nuthatch (*Certhia* and *Sitta*); swifts (*Cypselus*); nightjar (*Caprimulgus*); hedge sparrow (*Accentor*); warblers of all kinds (*Sylvia*, *Acrocephalus*, &c.); gold and fire-crested wrens (*Regulus*); common wren (*Troglodytes*); tits of all kinds (*Parus*, *Panurus*, &c.); fly-catchers (*Muscicapa*); wagtails (*Motacilla*); the swallows (*Hirundo*, *Chelidon*); pipits (*Anthus*, &c.); crossbills (*Loxia*); goldfinch (*Carduelis*); and the common and rose coloured starlings (*Sturnus* and *Pastor*).

Harmful Birds.—Among these are included certain eagles (*Aquila*, *Haliaetus*, &c.); the osprey (*Pandion haliaetus*); kites (*Milvus*, *Nauclerus*); falcons of all kinds, except the kestrel (*Falco tinnunculus*), and two less well-known species; the sparrow hawk (*Accipiter nisus*); the harriers (*Circus*); the eagle owl (*Bubo maximus*, Flem.); the raven (*Corvus corax*); magpie (*Pica rustica*); jay (*Garrulus glandarius*); and some other birds of less interest to agriculture.

It may be noted that birds such as the lapwing and cuckoo are omitted, while the rook and the wood pigeon are also not mentioned. The sparrow (*Passer domesticus*), undoubtedly the most destructive of birds in this country, is also omitted.

* *Révue Générale Agronomique*, May, 1906.

**Distribution of
the Board's
Leaflets.**

In the course of 1905 several new developments in the issue and distribution of the Board's leaflets were introduced, with the object of bringing the leaflets to the notice of those who were most likely to profit by them, and at the same time, often least likely to see them. A circular letter was sent in February to the Clerks of all Urban and Rural District Councils in England, saying that the attention of the Board had frequently been called to the defective and unsatisfactory state of many of the pigsties in Great Britain, not only in the neighbourhood of towns, but also in country places, and drawing attention to the recommendations set out in leaflet No. 121 on the Construction of Pigsties. It was asked whether any steps could be taken to bring them to the notice of the pig-owners in each district. The circular letter met with a very ready response. No fewer than 752 local Authorities replied that they would be prepared to distribute copies of the leaflet, and in a very short time 90,000 were in this way put into the hands of small pig-owners. At the request of some of the Welsh authorities, the leaflet was afterwards translated into Welsh, and 9,000 copies were in the same manner circulated in the Principality. A number of local authorities distributed copies of the leaflet, No. 146, on Milk Tests for Farmers, among the cowkeepers and dairymen in their neighbourhood, and later in the year, when leaflet No. 151, on Cleanliness in the Dairy, was published, several medical officers of health and sanitary inspectors applied for copies, which were sent by them to the same class of people. Some of the large milk supply companies circulated copies among their milk producing customers, so that about 22,000 were distributed in one way and another during the last five months of the year.

During the course of the year the Board issued a leaflet on the Felted Beech Coccus (*Cryptococcus Fagi*), and as they were informed that the pest was on the increase, and that large numbers of trees were attacked, they thought it advisable to give the leaflet the widest possible circulation among persons interested. The Royal English Arboricultural Society, the Royal Scottish Arboricultural Society, the Land Agents' Society, the Scottish Factors' Society, the Surveyors' Institution,

and the Royal Horticultural Society very kindly sent a copy to every member of the respective societies. In this way about 15,000 leaflets were distributed mainly among the persons most likely to be concerned with the preservation of beech trees.

During the latter part of the summer a somewhat similar attempt was made in another direction. An influential meeting of maltsters, brewers, barley dealers, threshing-mill owners and others interested in the question of dressing barley was held in Edinburgh in June, with the object of calling attention to the unsatisfactory manner in which much of the barley grown in Great Britain is threshed. The matter was considered to be of urgent importance, and the assistance of the Board was invoked. A short note on the Threshing of Barley was issued in the *Journal* for July, and this was subsequently reprinted as a leaflet (No. 149) and steps were taken to secure its circulation amongst persons interested. The Highland and Agricultural Society distributed 2,000 copies amongst farmers and those engaged in the barley trade. Thirteen maltsters and barley merchants took 250 copies each for circulation, and twenty-four agricultural societies sent copies to their members. A number of gentlemen undertook to issue copies to all farmers in the more important barley growing districts by means of the post, so that in all 40,000 leaflets were distributed during the barley season.

The total number of leaflets sent out in 1905 was 1,648,000, compared with 1,342,000 in 1904.

The number of single copies of leaflets distributed during 1905 was probably reduced by the issue at a charge of 6d. of the bound volume of leaflets Nos. 1—100. The demand for these books continued throughout the year, and no fewer than 7,000 copies were disposed of in the course of the twelve months. Many letters were received by the Board testifying to their usefulness, convenience, and cheapness, and it is clear that many persons have found that in their bound form the leaflets are easier to preserve and consequently to consult than when loose. One interesting example was brought to the Board's notice. A certain farmer calling on a friend found a bound copy of the leaflets lying on the table, and during his host's absence from the room looked at its contents. On his friend's

return, he cried, "If what this book says is right I have got sheep scab in my flock," and as a consequence reported the case to the police when he got home, with the result that his suspicions were verified.

The sectional volumes of leaflets were first issued in September, and by the end of the year 1905, some 24,000 had been distributed.

An interesting example of the application of co-operative methods to insurance against fire is afforded by the St. Columb

**Co-operative
Insurance
against Fire.**

District Mutual Fire Assurance Company, which has been in existence since 1865.

Its business has been confined to the insurance against fire of agricultural risks only, and the operations of the Company have been limited to the area comprised in the sixteen parishes of the St. Columb Major Union, with the result that in January, 1902, no less a sum than £236,000 was rated for contribution. The losses are paid by an assessment on the members in proportion to the sums insured, subject to adjustment in the case of certain risks.

During the period of thirty-eight years from 1865 to 1903, the members have been called upon for a total contribution of 14s. 6d. per cent. on the amounts at which they have been respectively rated for contribution. This is an average of a little over $4\frac{1}{2}$ d. per cent. per annum during the whole period. The calls are exclusive of entrance fees, which every member is called upon to pay upon joining the Company. Up to 1885 the entrance fee was 1s. per cent., but since that date it has been 2s. 6d. per cent. These payments have been sufficient to cover losses incurred as well as to pay the office and other expenses of administration.

Much of the success of the Company is attributable to the fact that care is taken in the acceptance of the risks and that proposers are not permitted to become members indiscriminately, but are required to be properly recommended before they are admitted.

The Company appoints in the various parishes inspectors who are acquainted with the property insured. This local knowledge

is a safeguard against excessive claims, whilst ample protection is given to the policy holders by the policy conditions which, in the main follow those of other fire insurance companies. The policies do not extend to injury or death by lightning.

The Danish Government have recently undertaken an enquiry into the results obtained from the legislation of 1899 which was intended to facilitate the provision of small holdings for agricultural labourers. Under the Act of 1899, which was re-enacted in a somewhat amended form in 1904, a committee is to be organized in every county council division to co-operate in procuring plots of land for *bonâ fide* agricultural labourers. The labourers must be able to provide one-tenth of the total cost of the land, suitable buildings, stock, implements, &c.

**Allotments for
Agricultural
Labourers in
Denmark.**

The land is to be from $2\frac{3}{4}$ to $10\frac{1}{2}$ acres in extent, and its total value must not exceed about £280. If all the requirements are satisfied, including the production of evidence that the applicant is in possession of the necessary means to provide buildings, cattle, tools, &c., a loan from the State equal to nine-tenths of the mortgage value of the property can be obtained. The interest on the loan is 3 per cent., and no principal is to be repaid during the first five years; after that 4 per cent. is to be paid on two-fifths of the loan for interest and principal, and when this part has been repaid, the rest of the loan is to be repaid at the same rate.

A sum of 3,000,000 kr. (£167,000) is to be set aside every year for five years for this purpose. During the five years, April, 1900, to 31st March, 1905, 1,859 allotments were acquired in this way, with loans amounting to £363,000.

From the enquiry* referred to above, it appears that about two-thirds of the holdings are in Jutland, and the remainder in the Islands. Satisfactory replies were received from the owners of 1,814 out of the 1,859 holdings, and these returns showed 9,145 persons as resident on the allotments, or about five to

* *Deutscher Reichsanzeiger*, August 17th, 1906.

each holding. Of the owners 495 were under 30 years of age, 758 under 40, 467 under 50, and the remainder above that age. Nearly all of them were married. The great majority (1,465) were agricultural day labourers, 202 were in regular service, and 147 had some other occupation. The total area amounted to 14,552 acres, or nearly 8 acres each. The quality of the soil naturally varied very greatly, and the price ranged from £3 8s. to £29 per acre. The live stock which were returned on 1,517 of the holdings, numbered 642 horses, 4,714 cows, 5,351 pigs, 722 sheep, and 38,327 head of poultry.

The majority of the holders appear to be members of co-operative societies, and so far as the returns were filled up, they showed that nine-tenths were members of co-operative dairies, one-third members of bacon curing societies, and one-fourth members of societies for the co-operative sale of eggs.

Admission of Shorthorn Cattle into Cuba.—The Cuban *Gaceta Oficial* for the 27th June contains a Decision of the

**Miscellaneous
Notes.**

Cuban Secretary of Finance to the effect that "Short Horn" cattle are to be admitted into Cuba free of duty, under No. 184 of the tariff, the term "Short Horn" being held to be equivalent to "Durham." Importers must duly prove the origin of the cattle, and comply with the other regulations on the subject.

Sheep Farming in the Northern Caucasus.—According to a Report from Mr. Consul Medhurst, forwarded by the Foreign Office, sheep farming in the Northern Caucasus dates from the year 1860, when peasants from other provinces wandered to the then unoccupied steppes in search of pasturage for their flocks and herds. These first settlers prospered and reached their highest prosperity in 1880, merino wool being not only supplied to the interior of Russia, but also exported in considerable quantities. The opening of the port of Novorossisk and the advent of the railways arrested the further development of sheep farming owing to the number of settlers who poured into the country. These latter took up land for wheat-growing, and as the acreage under cultivation increased the value of the steppe land and the

price of labour rose proportionately, so that sheep farming has become unprofitable. The number of sheep reared in the Caucasus is diminishing every year, and sundry farmers have removed their flocks to the vast steppes of South-Western Siberia, where land is to be had for nominal prices. It is anticipated that emigration to this district is likely to be successful, and that in this way millions of acres in the Caucasus will be available for grain-growing and to supply the wants of the Russian peasant.

Poultry Exhibition at Moscow.—The Board of Agriculture and Fisheries are informed by the Russian Embassy, through the Foreign Office, that an exhibition of poultry, which will include an international section, will be held at Moscow in November next by the Russian Poultry Society. The Exhibition will be open from the 29th November to the 4th December.

The Mediterranean Fruit Fly (Ceratitis Capitata).—This insect is a serious pest in many places, particularly in South Africa and Australia, and it has been found in Great Britain.* In the *Comptes Rendus* (Aug. 20th), of the French Academy of Sciences, M. Alfred Giard draws attention to the fact that six years ago its presence was observed on apricot trees at Courbevoie, in the neighbourhood of Paris. It was then very rare. Since that time, however, it has increased, and now the peach trees in various districts round Paris are seriously attacked.

M. Giard urges the importance of investigations into its life-history, particularly as regards any modification due to climate the conditions under which it hibernates, and whether it has attacked any wild fruit growing in the neighbourhood of the infested orchards and fruit gardens. He also suggests that steps should be taken to prevent its importation with foreign fruit.

The Board would be glad if any instances of its occurrence in Great Britain could be brought to their notice.

Hessian Fly in North of Scotland.—The Board of Agriculture and Fisheries have received information that the crops in certain parts of the North and East of Scotland have been affected by the Hessian Fly. A leaflet containing a description of this pest

* *Journal*, Vol. XII., p. 690, February, 1906.

and advice as to the measures to be taken may be obtained on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

Black Scab of Potatoes in North Wales.—The Board of Agriculture and Fisheries have received information that the disease of Black Scab of Potatoes, which was first observed in this country in the autumn of 1901, has spread among some of the gardens in North Wales during the present season. A leaflet dealing with this disease may be obtained from the Offices of the Board.

CORN PRICES IN THE HARVEST YEAR.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels computed from the Weekly Averages of Corn Returns, together with the QUANTITIES returned as sold at the Returning Markets during each of the Harvest Years ending 31st August, 1895 to 1906.

HARVEST YEARS.	PRICES.			QUANTITIES.		
	Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>Quarters.</i>	<i>Quarters.</i>	<i>Quarters.</i>
1894-95 ...	21 5	21 5	14 8	2,180,959	3,136,415	693,121
1895-96 ...	24 10	22 4	14 1	1,640,943	3,366,364	672,547
1896-97 ...	28 8	23 2	16 9	2,597,268	3,200,612	551,912
1897-98 ...	36 2	26 11	18 3	2,534,224	3,339,842	599,666
1898-99 ...	26 0	26 1	17 3	3,498,515	3,629,760	777,676
1899-00 ...	26 4	25 2	17 4	3,255,654	3,355,241	722,859
1900-01 ...	27 1	25 0	18 1	2,403,341	3,109,149	684,956
1901-02 ...	28 4	25 11	20 4	2,451,275	3,176,599	698,840
1902-03 ...	26 5	23 4	17 8	2,386,017	3,151,337	1,104,660
1903-04 ...	27 2	21 10	16 4	2,129,448	2,780,473	1,132,086
1904-05 ...	30 7	24 6	17 0	1,746,927	3,141,058	1,178,154
1905-06 ...	28 9	24 2	18 5	2,940,263	3,202,613	940,015

ADDITIONS TO LIBRARY DURING SEPTEMBER.

Africa—

Cape of Good Hope.—Acting Chief Conservator of Forests and Conservators of Forests. Reports for 1904-5. (167 pp.)

Report of the Select Committee on Crown Forests. (164 pp.) 1906.

Southern Rhodesia.—Department of Agriculture. Report for 1905-6. (27 pp.)

Egypt.—Khedivial Agricultural Society. Year-Book, 1905.

Australasia—

New Zealand.—Department of Agriculture:—

Viticulture in New Zealand. (60 pp.) 1906.

Agriculture in Other Lands (Great Britain, Denmark, Canada, South Africa and Argentine). (90 pp.) 1906.

Canada—

Prince Edward Island.—Department of Agriculture. Report for 1905. (125 pp.)

Denmark—

Aarsberetning om det Landhusholdningsselskabs Virksomhed i 1904-5. (313 pp.) Beretning om den under Landbrugsministeriet sorterende landøkonomiske Konsulentvirksomhed, 1905:—

I Hefte: Det Almindelige Konsulentmøde i 1905 den 27 Oktober, 1905. (93 pp.)

II Hefte: Konsulenternes Indberetninger. (226 pp.)

Christensen, A.—Kartoffel og dens Dyrkning. (96 pp.) 1905.

Landøkonomisk Aarbog for 1906. (196 pp.)

France—

Grandeau, L.—L'Agriculture et les Institutions Agricoles du Monde au commencement du XX^e siècle. 2 vols. (754 + 751 pp.) 1905.

Grandeau, L.—La Production électrique de l'Acide nitrique avec les Éléments de l'Air. (60 pp.) 1906.

Worms, R.—Études d'Économie et de Législation rurale. (304 pp.) 1906.

Delège, E.—Mutualité Agricole. (110 pp.) 1906.

Ratouis de Limay, H.—L'Enseignement Agricole par les Syndicats Agricoles. (37 pp.) 1905.

Zolla, M. D.—Code Manuel du Propriétaire Agriculteur. (365 pp.) 1902.

Germany—

Jahresbericht der Vereinigung der Vertreter der Angewandten Botanik. 1904-5. (284 pp.)

Ramm, Dr. E., und Buer, Dr. H.—Nachrichten aus den hervorragenden Pferdezuchtgebieten des In und Auslandes. (312 pp.) 1901.

Great Britain—

Iggulden, W.—The Tomato. (122 pp.) 1901.

Coulter, J. M.—A Text-Book of Botany. (365 pp.) 1906.

Turner, W. Pickett.—Tuberculosis. (96 pp.) 1906.

Institute of Chemistry.—A List of Official Chemical Appointments. (123 pp.) 1906.

India—

Memoirs of the Department of Agriculture.—Botanical Series. Vol. I.:—

No. 1. Studies in Root-Parasitism The Haustorium of *Santalum Album*. (1) Early Stages, up to Penetration. (30 pp.) 1906.

No. 2. Indian Wheat Rusts. (58 pp.) 1906.

No. 3. Fungus Diseases of Sugar-Cane in Bengal. (53 pp.) 1906.

Department of Agriculture.—Forest Bulletin No. 8:—A Note on the Life History of *Hoplocerambyx Spinicornis*. (11 pp.) 1906.

United States—

Office of the Secretary.—Circ. 20. Adulteration of Alfalfa Seed. (2 pp.)

Bureau of Entomology.—Tech. Series (No. 12), Part II.:—Habits and Life Histories of some Flies of the Family Tabanidae.

Bull. 58, Part II. The Western Pine-Destroying Bark Beetle. (30 pp.) 1906.

Farmers' Bulletins:—

No. 261. The Cattle Tick. (22 pp.) 1906.

No. 265. Game Laws for 1906. (54 pp.) 1906.

Forest Service.—Bull. 69. Sugar Pine and Western Yellow Pine in California. (41 pp.) 1906.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of September, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 5	7 2	37 0	33 8
Herefords	7 7	7 0	—	—
Shorthorns	7 4	6 10	36 3	33 1
Devons	7 8	7 1	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
Veal Calves	d. 7½	d. 6½	d. 8½	d. 6½
Sheep :—				
Downs	8½	8	—	—
Longwools	8½	7½	—	—
Cheviots	9½	8½	9½	8½
Blackfaced	8½	8	9	8
Cross-breds	8½	8	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	6 11	6 6	6 7	5 10
Porkers	7 5	7 1	7 0	6 4
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 5	17 19	21 8	17 16
„ —Calvers ...	20 7	17 7	18 18	16 8
Other breeds—In Milk ...	17 6	14 18	19 13	16 2
„ —Calvers ...	15 15	14 10	18 4	15 6
Calves for Rearing	1 19	1 10	2 1	1 9
Store Cattle :—				
Shorthorns—Yearlings ...	9 7	7 11	9 5	7 13
„ Two-year-olds ...	12 3	10 10	14 3	11 9
„ Three-year-olds ...	15 13	13 8	16 10	13 12
Polled Scots—Two-year-olds	—	—	15 8	12 17
Herefords— „	13 10	—	—	—
Devons— „	10 0	9 0	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	36 2	32 2	—	—
Scotch Cross-breds ...	—	—	31 6	26 10
Store Pigs :—				
Under 4 months	30 0	23 5	26 9	21 4

* Estimated carcase weight.

† Live weight.

**AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of September, 1906.**

*(Compiled from Reports received from the Board's Market
Reporters.)*

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	49 6	47 6	49 0	—	57 6*	53 6*
	2nd	47 0	43 0	45 6	—	54 6*	46 6*
Cow and Bull ...	1st	—	41 0	41 0	39 0	43 0	42 0
	2nd	—	36 6	36 0	35 0	32 6	34 0
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	48 6	46 0	45 6	46 0	—	49 0
	2nd	46 0	40 0	39 6	41 6	37 6	39 6
Argentine Frozen—							
Hind Quarters ...	1st	34 6	34 6	35 0	34 6	35 0	35 6
Fore „ ...	1st	23 0	25 6	25 6	24 0	25 6	26 0
Argentine Chilled—							
Hind Quarters ...	1st	41 0	42 6	37 6	37 6	—	43 0
Fore „ ...	1st	26 0	27 6	25 6	25 6	—	29 6
American Chilled—							
Hind Quarters ...	1st	55 0	53 6	53 6	53 0	55 6	55 6
Fore „ ...	1st	31 0	32 6	32 0	32 0	34 0	34 0
VEAL :—							
British	1st	67 6	56 6	61 0	67 6	—	—
	2nd	61 0	43 6	56 6	62 6	—	—
Foreign	1st	71 0	—	—	—	—	—
MUTTON :—							
Scotch	1st	74 6	70 0	76 6	76 0	78 6	78 0
	2nd	68 0	57 6	71 0	71 0	65 6	63 0
English	1st	69 6	70 0	73 0	71 0	—	—
	2nd	64 6	56 0	67 6	66 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	—	—	—	—	—
Argentine Frozen ...	1st	30 6	34 6	34 6	34 6	33 0	35 0
Australian „ ...	1st	29 0	31 0	32 6	32 6	34 0	—
New Zealand „ ...	1st	35 6	34 0	36 6	36 6	33 0	—
LAMB :—							
British	1st	79 6	71 6	75 0	75 0	79 6	78 6
	2nd	73 0	66 6	70 0	70 6	66 6	66 0
New Zealand ...	1st	44 6	45 6	45 6	45 0	46 6	49 6
Australian ...	1st	39 0	42 0	39 6	39 6	—	—
Argentine ...	1st	—	39 6	—	—	—	42 0
PORK :—							
British	1st	65 6	64 6	62 6	62 6	56 6	54 0
	2nd	60 6	56 0	58 6	57 6	53 6	48 0
Foreign	1st	62 6	62 0	60 0	60 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (<i>in</i> 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>	<i>s.</i>	<i>d.</i>
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21 ...	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28 ...	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5 ...	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12 ...	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19 ...	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26 ...	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2 ...	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9 ...	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16 ...	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23 ...	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30 ...	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7 ...	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	2
" 14 ...	26	10	32	3	30	5	18	9	23	10	23	8	17	6	19	7	20	4
" 21 ...	27	7	32	2	30	3	18	10	23	7	23	2	17	6	18	11	20	5
" 28 ...	28	0	32	3	30	5	19	9	23	11	22	4	17	10	19	3	20	2
Aug. 4 ...	28	3	31	11	30	9	19	9	22	0	22	1	17	10	18	4	19	3
" 11 ...	28	4	30	5	30	5	19	9	22	5	23	0	17	7	16	11	17	11
" 18 ...	28	8	28	5	29	0	22	5	23	4	24	2	16	7	16	4	17	0
" 25 ...	29	5	27	1	27	9	23	2	23	6	25	0	16	5	15	9	16	10
Sept. 1 ...	30	2	26	11	25	9	25	3	23	5	24	3	16	3	15	9	16	6
" 8 ...	30	0	27	1	26	4	24	10	23	4	24	9	16	1	15	11	16	3
" 15 ...	29	7	26	11	25	11	24	9	23	7	24	3	15	11	16	0	16	1
" 22 ...	29	10	26	8	25	9	25	10	23	10	24	3	15	9	15	11	16	0
" 29 ...	29	10	26	9	25	9	25	5	24	3	24	8	15	8	16	1	16	2
Oct. 6 ...	30	2	26	9	26	1	25	6	24	9	25	0	15	9	16	3	16	3
" 13 ...	30	5	26	11			25	4	24	10			15	8	16	6		
" 20 ...	30	4	27	1			25	5	25	0			15	11	16	7		
" 27 ...	30	6	27	4			24	11	24	11			15	10	16	8		
Nov. 3 ...	30	6	27	10			25	0	24	9			16	0	17	1		
" 10 ...	30	3	28	3			24	6	24	10			15	11	17	4		
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	0	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: August ...	39 5	39 7	24 11	25 1	21 0	23 2
September...	38 0	38 9	24 0	25 0	20 0	22 6
Paris: August ...	41 0	39 11	25 7	25 10	22 1	24 4
September...	39 5	38 9	24 2	25 5	20 2	22 2
Belgium: July ...	32 1	29 8	23 4	23 11	22 0	22 7
August ...	30 10	29 5	22 4	22 10	20 4	20 10
Berlin: June ...	37 11	39 10	—	—	20 0	23 8
July ...	37 9	39 8	—	—	19 7	22 10
Breslau: June ...	35 2	36 10	24 6	27 0 (brewing) 24 7 (other)	19 3	23 3
July ...	35 6	37 4	23 9	27 3 (brewing) 26 3 (other)	18 9	23 9

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of September, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	27 11	27 6	24 9	25 11	16 9	17 1
Norwich ...	26 10	26 2	22 9	24 1	15 1	15 8
Peterborough ...	26 0	25 2	23 0	23 11	15 2	15 5
Lincoln ...	26 3	25 9	23 8	24 7	15 7	15 7
Doncaster ...	26 6	26 2	21 3	22 9	15 5	16 2
Salisbury ...	26 10	25 9	24 3	22 8	16 8	17 2

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of September, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
BUTTER :—								
British... ..	14 6 per cwt.	13 3 per cwt.	— per cwt.	— per cwt.	— per cwt.	— per cwt.	15 0 per cwt.	— per cwt.
Irish	114 6	113 0	118 0	115 0	115 0	111 6	116 0	—
Danish	125 0	122 6	126 0	123 6	127 0	123 6	125 0	—
Russian	105 6	102 0	121 6	117 0	102 0	98 0	104 6	97 6
Australian ...	116 0	113 6	—	—	—	—	—	—
New Zealand...	116 6	114 0	—	—	—	—	—	—
CHEESE :—								
British, Cheddar	76 0	72 0	— 120 lb.	— 120 lb.	73 6 120 lb.	69 6 120 lb.	67 0	63 6
„ Cheshire	—	—	64 6 per cwt.	58 6 per cwt.	68 6 per cwt.	64 0 per cwt.	—	—
Canadian ...	62 6	61 6	63 0	60 6	62 0	61 0	63 0	60 0
BACON :—								
Irish	69 0	66 6	69 6	67 6	69 0	66 0	67 6	65 0
Canadian ...	63 0	—	64 6	61 0	64 0	60 0	65 6	62 6
HAMS :—								
Cumberland ...	106 6	100 0	—	—	—	—	—	—
Irish	103 0	99 6	—	—	—	—	106 0	98 0
American (long cut) ...	58 6	—	62 6	58 6	57 6	54 6	61 0	57 6
EGGS :—								
British... ..	per 120. 12 8	per 120. 11 8	per 120. —	per 120. —	per 120. —	per 120. —	per 120. —	per 120. —
Irish	11 6	—	10 0	8 11	9 7	8 3	9 3	8 8
Danish	10 11	9 6	10 6	8 11	9 7	8 9	9 8	8 9
POTATOES :—								
British Queen	per ton. 63 6	per ton. 55 0	per ton. —	per ton. —	per ton. 45 0	per ton. 38 6	per ton. 55 0	per ton. 50 0
Puritan	63 6	58 6	—	—	50 0	45 0	—	—
Up-to-Date ...	70 0	60 0	—	—	43 6	40 0	50 0	45 0
HAY :—								
Clover... ..	101 6	91 6	80 0	70 0	95 0	70 0	70 0	62 6
Meadow	94 0	83 6	74 0	65 0	—	—	68 0	60 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	SEPTEMBER.		9 MONTHS ENDED SEPTEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	79	51	848	643
Swine Slaughtered as diseased or exposed to infection ...	470	236	4,809	2,908
Anthrax :—				
Outbreaks	68	95	675	741
Animals attacked	86	133	977	1,027
Glanders (including Farcy) :—				
Outbreaks	84	111	823	947
Animals attacked	151	189	1,541	1,632
Sheep-Scab :—				
Outbreaks	9	22	308	676

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	SEPTEMBER.		9 MONTHS ENDED SEPTEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	7	10	81	134
Swine Slaughtered as diseased or exposed to infection ...	84	199	914	1,398
Anthrax :—				
Outbreaks	—	—	3	3
Animals attacked	—	—	7	5
Glanders (including Farcy) :—				
Outbreaks	—	5	6	18
Animals attacked	—	20	14	55
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	12	10	172	238



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THE SELECTION AND MILKING OF DAIRY CATTLE.

The importance of obtaining really first-class dairy stock has for a long time been recognised by practical men, and the degree of perfection which has been attained in the production of excellent types is well seen in the results obtained by the specialist breeders of the Channel Island and Ayrshire cattle. In the production of cattle for dairying purposes the object to be kept in view is the purpose for which the milk is being produced. There are, first of all, those whose object is milk-selling, and who wish to obtain a large volume of milk, the quality of which should exceed the limit prescribed by the Sale of Milk Regulations, and yet not be so excessively rich as to cause a corresponding reduction in quantity; secondly, there is the farmer, whose object is butter-making, in which case the quantity of milk produced is not of so much importance as its richness in fat, for it is this constituent of milk alone which can be used in the production of butter; and, thirdly, there is the cheese-maker, who aims at obtaining milk which is neither too rich nor too poor, but which will produce cheese of uniform good quality, and if manufactured into butter at times of the year when cheese-making is not carried on, will yield a satisfactory amount of butter.

Suitable Breeds.—As examples of breeds which are specially suitable to each of these three classes may be mentioned Short-horns for milking, Jerseys and Guernseys for butter, and Ayrshires for cheese. There are also many milk-sellers whose

object is to find a cow of either a pure or cross-bred type that will give milk good in quantity and ample in quality. The animal that will yield eight hundred to a thousand or more gallons of milk a year is a most valuable asset ; especially is this the case if the milk is well up to the limit, for at times, when milk is fetching a low price, it may be kept at home and manufactured into either butter or cheese. Cows that will yield the quantity of milk specified may be either bred or bought, though in all probability the average quantity of milk yielded per cow throughout the country would amount to little more than 400 gallons. Cows yielding a large quantity of milk cost little, if any more, for keep and labour, while the returns obtained are sufficient to make the difference between a large profit and a small loss. Another point to be taken into consideration in selecting for the dairy is that a cow, after her milking days are finished, should be able to put on flesh and be saleable as beef. Evidently dual-purpose cattle, such as those that will milk well and afterwards when fed will produce good beef, are a type much to be desired ; but there is, naturally, a difficulty in finding any breed which combines in the highest degree the best milking and feeding qualities. Before tabulating the special characteristics of the dairy cow and the points which will help in the selection of general purpose cattle, the suitability of the leading dairy breeds for certain districts and purposes may be pointed out :—

<i>Suitable for</i> <i>Good Land.</i>	<i>Suitable for</i> <i>Exposed Country.</i>	<i>Specially Adapted for</i> <i>Milk-selling.</i>	<i>Most Suitable for</i> <i>Butter-making.</i>
Shorthorns.	Welsh.	Shorthorns.	Jerseys.
South Devons.	Ayrshires.	Welsh.	Guernseys.
Jerseys.	Shorthorns.	Ayrshires.	South Devons.
Guernseys.	Kerries.	Kerries and Dexters.	
	Dexters.	Dutch.	
	Lincoln Reds.		
	Redpolls.		

Suitable for either Milk-selling, Butter-making, or Cheese-making.—Shorthorns, Ayrshires, Welsh, South Devons, and Lincoln Reds.

For cheese-making localities, Shorthorns, Ayrshires, Devons, Welsh and other classes are most in demand. Where the morning milk has a tendency to contain a low percentage of butter-fat, as is sometimes the case with the heavy milking breeds, an addition of about 10 per cent. of milk from Channel

Island cows will help to raise the general quality of the milk and to maintain the required amount of fat.

Points of Dairy Cattle.—The special points to be considered in the purchase and judging of dairy cattle are:—(1) Temperament of the animal; (2) shape of the udder; (3) general appearance denoting milking qualities; (4) indications regarding quantity of milk yielded; (5) points indicating constitution and quality of milk yielded. In examining dairy cows, all the points which past experience has taught are indicative of milking strain must be taken into consideration.

1. *Temperament.*—The cow should be quiet when handled, possess a clean coat, a long neck, with eyes prominent and wide apart, the whole expression showing a gentle and phlegmatic temperament.

2. *Shape of Udder.*—The udder or bag should extend well forward, whilst the fore teat in some cows will be found in a vertical line with the hip bone. The udder should be full and come up well behind under the tail, the whole vessel showing great capacity, each quarter being sound and the teats easy to draw. The teats should be equidistant apart, squarely set on, and of a useful size for milking.

3. *General Appearance denoting Milk.*—A first-class dairy cow is somewhat wedge shaped when viewed from the side; the neck should be thin and longer than in a feeding beast, whilst the shoulders should be light and oblique. The abdomen should be capacious, the flank clean and thin, being lean rather than fat. The back of a heavy milking cow is usually thin, a good back showing strong spinal processes. When viewed from above the animal should also appear wedge shaped, being narrow on the shoulder blades, the lines spreading out to the hips, which must be wide apart. Incurving thighs allow plenty of space for the development of the udder. A well-set, long, and tapering tail, with plenty of switch is desirable. Action and bone are points not to be overlooked; the shanks should be clean, and the animal when walking have freedom from a sweeping movement. If the cow is one of the Channel Island breed, the hoof should be small and of bright colour.

4. *Indications regarding Quantity of Milk Yielded.*—Milk veins should be large, prominent, and branched, and the milk

"wells," where the blood-vessels enter the belly, highly developed. Milk veins are blood-vessels carrying away impure blood from the udder back to the heart and lungs for purification ; as milk is derived directly from the blood, it follows that the greater the supply of blood passing through the udder the greater the possibilities of the production of a large quantity of milk. The "escutcheon" or "milk mirror" should be wide at the thighs, and if of the "flandrin" order, run in a broad band up to the vulva. The back of the udder, just above the teats, should show two "ovals" of down-growing hair, the skin being fine and elastic and having a mellow touch.

5. *Points indicating Quality and Colour of Milk.*—"Touch," which is best judged by taking hold of a portion of the skin and flesh behind the last rib when the cow's head is turned slightly towards you, should be mellow, the skin loose and rather thin, and of a slightly oily nature, and the hair soft and velvety. Ears which are fine, well fringed with hair, and of a deep yellow colour inside, are usually certain indications of good quality and colour of milk and of butter. Horns should be yellow at the base and show no coarseness, the shape of the head to incline rather to the Jersey than to the Ayrshire type. Points indicating quality and colour of milk are much more apparent in Channel Island cattle than in other breeds. Constitution—a deep chest gives plenty of room for lung development, whilst wide and open nostrils commonly show good lung capacity. The ribs immediately behind the shoulder, if round and deep, make a big heart girth, whilst other ribs wide apart give the cow the appearance of strength and solidity. Generally speaking, a good cow possesses a loosely-knit frame.

Value of the Score Card.—Numbers may be affixed to all the points above-mentioned for the benefit of students who may wish to score animals coming under their observation. It is an excellent means of drawing attention to the good and bad qualities of an animal to have to fill up a score card, especially if someone well versed in a knowledge of live stock is at hand to make at the same time a separate score of the animal and compare results, and aid by giving his criticism. It is a method of teaching the points of live stock that has long been in vogue in Canada and the States, and it is now being adopted at some of the agricultural colleges in this country.

MILKING.

There is at the present time a great demand on the part of the public for a pure milk supply, and the chief responsibility for this rests upon the owners of cows. It is the duty of those engaged in the production and sale of milk to see that all cows are in good health, and fed in such a manner as to produce sound milk. In a well managed herd the careful attention of the foreman or owner is essential to see that the milk from any cow not in perfect health should not be mixed with the general supply. The milk from any cow continually ailing should not even be given to pigs or poultry unless previously well boiled, as there is always danger of the transmission of disease. Naturally, in a herd of cows there are many animals which will suffer from ailments which are of a temporary character. Such cases should be given immediate attention, and the milk for the time should not be used with the rest.

Cleanliness.—Cleanliness is one of the most important items in connection with all dairy work, and unless the cows are treated and milking carried out in a cleanly manner, no amount of subsequent skill in the dairy will be of any avail in the production of milk of a high quality. Cows should be kept well groomed, and the udder carefully rubbed over with a brush or wet cloth before milking is commenced. Milkers should wear clean garments and wash their hands prior to commencing operations and again after each cow is milked.

Clean Milking.—The use of any organ of the animal body undoubtedly promotes its development, and this particularly applies to the udder, for the process of milking, if carried out thoroughly, increases the milking capacity. To secure the greatest development of the udder, it is necessary that the milking should be carried out very completely, and hardly a drop left behind at the end of each operation. There are two reasons for withdrawing all the milk that can be obtained from the udder: firstly, to develop and increase the milking powers; secondly, to obtain the richest portions yielded during the whole of the milking, namely, the "strippings" as they are called, which contain from 8 to 10 per cent. of fat, while milk of average quality contains only 3·7 per cent. of fat. Failure to withdraw all the milk from the udder at milking is the

commonest cause of cows drying off soon, for a prolonged lactation period can only be obtained where the complete removal of milk at each milking is effected.

Stripping.—The common method of milking, namely, that of grasping the teat with the full hand and exerting a slight downward pull at the time the hand is closed, is not effective in stripping the cow. Stripping is easily carried out by the method known as streak milking, in which the teat is taken between the thumb and fore-finger, or fore-finger and middle finger, then tightly pressed and drawn downwards. This method of milking is very suitable for the purpose of stripping as by its adoption practically all the milk from the udder may be withdrawn. It is not advisable for ordinary milking, though it is sometimes used, on account of its being likely to irritate the teat externally, and even in some cases to cause inflammation.

It is a vexed question as to which teats should be milked together. By taking, say, the two fore teats, and then the two hind teats, the position of the hands becomes somewhat cramped. Perhaps the best way, in order to get a good delivery of the milk to the pail, is to grasp a near fore and an off hind teat, and then reverse the order. In the majority of cows the hind teats yield the most milk. This operation is not usually completed simultaneously if one hand is being used to milk a fore and the other a hind teat.

Hard Milkers.—Cases are frequently met with in which cows are very difficult to milk, being termed hard milkers. Such cows have become so by the milker having for a lengthened period adopted a severe method of withdrawing the milk, such as the streak method before mentioned, the result being that persons accustomed to using the more gentle method would find difficulty in milking such cows.

Wet or Dry Milking.—Milking may either be performed with wet or dry hands, in the latter case the hands being moistened by a few streams of milk being milked on to them. There are a great many competent persons who favour either method, but taking all points into consideration, the dry method is undoubtedly the more cleanly of the two, and is the one adopted by the best dairymen, though the other appears to be the way nature has suggested for the withdrawing of the milk

If the hands be moistened in some other than the filthy way of dipping them into a pail, and always provided that the hands are scrupulously clean, moist hand milking is not so highly objectionable as may be supposed. The small amount of fat in the milk acts as a natural lubricant whereby the friction on the teat is minimized and less discomfort caused to the cow by the withdrawal of the milk. In cases where the wet-handed milking is employed a lot of dirt becomes dissolved and finds its way into the milk, but on the other hand, in similar cases with dry-hand milking, particles of dry dirt, excoriations, hairs, &c., may find their way in equally large quantities into the milk pail.

Essentials of Good Milking.—The essentials of good milking are that it should be performed, (1) Quietly : that is to say, the milk should be withdrawn in a manner that will cause no discomfort to the cow; (2) Quickly : if performed quickly more milk is obtained, for rapid milking appears to be beneficial in increasing the flow. The comparison of the results obtained by good and inferior milkers makes this point very clear. A good milker is able to milk from seven to ten cows in an hour, the common indication of good milking being the production of plenty of froth or “head” upon the milk in the pail. (3) Thoroughly : the last milk, being the richest, must always be withdrawn.

In the milkers' contest held at the London Dairy Show, in which no competitor is allowed to milk his own or his employer's cows, the following are the points upon which competitors are judged :—

	Points.
1. Manner of approaching the animal, and style of work	20
2. Cleanliness	10
3. Clean stripping	10
	—
	40
	—

The practice of many milkers is brutal in the extreme, and positively dangerous to in-calf cows. On the other hand, many cows seem to enjoy the milking process, and whilst all get accustomed to and expect milking to be carried out at certain fixed times, much depends upon the milker as to whether the cows look forward to the milking time or not.

Time of Milking.—The common practice is to milk twice in twenty-four hours, and the more nearly the time can be divided into equal parts the more uniform will be the quality of the milk produced. For example, if milking takes place at six o'clock in the morning, the next milking time should be as near six in the afternoon as possible; this is easy to recommend, but difficult to carry out in practice, especially in the case of those farmers who supply warm milk for consumption in towns. There the demand is for milk to be delivered before breakfast, and again for tea, which often means starting milking at four o'clock in the morning, and again at twelve mid-day. This gives an interval in one case of sixteen hours, and in the other eight, and as a consequence it is frequently the case that the milk yielded at the morning milking is inferior in quality. Cows become regular in their habits, and like to be fed and milked at regular times. If milking is delayed they frequently become uneasy, and the irregularity may cause considerable depreciation in the amount of milk obtained. Cows which are left too long without milking get very distended udders, which may cause them considerable pain. Very heavy milkers have sometimes to be milked three times instead of twice a day, to relieve the pressure on the udder. Over stocking, or the practice of allowing the udder to become unduly distended with milk by failing to milk a cow previously to exposing her for sale at a market or sale, is a very common but cruel practice. It frequently leads to inflammation of the udder, and often loss of one or more quarters.

Kicking during Milking.—Owing to heifers being badly trained or ill-treated they often develop the habit of kicking during milking time. Frequently heifers when they first calve are very sensitive when being milked, and unless they are kindly treated, subsequently prove a great nuisance to the dairy farmer. Kind treatment in the early days is the method most suitable for preventing kicking, but many cows can only be milked when some means is applied to prevent them from kicking. Two means commonly employed are strapping the legs together with a heavy strap, or strapping one leg to the stall.

Drying Off.—Many cows are so prone to milk that they will continue milking from the birth of one calf till the next. Though

the continuous production of milk is valuable to the dairyman, the cow, unless allowed some period of rest between each calf, suffers very considerably from the strain. Whilst the majority of cows do not milk for more than nine months at a time, many good dairy cows only dry off for a month or so previous to calving. It is desirable that a resting period of a month or six weeks should be allowed to each cow before calving. The quantity of milk can be reduced by milking less frequently, finally milking once every other day, then every third day, or even more seldom than this, depending upon the condition of the udder, until so little milk is yielded that it is unnecessary to withdraw it.

Importance of Recording and Testing the Milk.—It is desirable that those who are anxious for the improvement of their dairy stock should weigh the milk of each cow morning and evening, and note it in a book specially kept for that purpose. In conjunction with the record of the weight of milk yielded by each cow, an occasional test for the amount of butter-fat present should be made (see Leaflet No. 146). The value of such records, which show both the quantity and quality of milk of individual cows yielded during their lactation period, cannot be over estimated. The value of the increased milk yield of the herd year after year, consequent on the judicious weeding out of inferior animals, well repays the small additional expense of the work entailed in making such records.

THEODORE R. ROBINSON.
C. W. WALKER-TISDALE.

ANIMAL FOOD FOR POULTRY.

Of the animal products which may be economically fed to poultry, the following are the principal: Waste meat scraps fresh from the butchers' stalls, raw fresh bones of oxen, sheep, pigs, &c., fresh blood, dried blood, and dried beef scraps or meat meal, fresh fish, skim milk, cracklings, greaves, tallow, fats, &c.

Considerable discretion must, however, be exercised in the use of these various articles. If fowls are fed too freely on them they suffer in health, and their use when in a stale, decaying,

or sour condition is injurious. Different kinds of animal food, moreover, are adapted for different purposes. It would, for instance, be useless to feed tallow, greaves, and similar fatty foods to growing chickens or laying hens, because they get enough fat from other sources, but for fattening purposes these foods are very suitable. Apart from fowls which are being actually fattened for killing, it may be taken as a general rule that all other classes, such as growing chickens, laying hens, and hens in moult, require a supply of animal food rich in protein in order to yield the best results.

Cut Green Bone.—Amongst the products available, the first place ought, perhaps, to be given to green bone. This is a term borrowed from America, and now applied by poultry-keepers on both sides of the Atlantic to fresh uncooked bones obtained from slaughter houses and butchers' shops. For a considerable number of years green bone has been used as a common article of fowl feeding in America, and there are several firms in that country which manufacture special machines for cutting bones. These must not be confused with bone mills as we know them in the British Islands, for there is a considerable difference between the two machines. A bone cutter is a machine for cutting fresh bones with marrow in them and with pieces of adhering meat, and it will also cut vegetables, scraps from the table, &c., but it will not cut or grind dried bones. On the other hand, a bone mill grinds dried bones into meal, but will not grind or cut fresh bones and similar soft substances.

The cost of a bone cutter may vary from £1 to £5. The smaller sizes are worked by hand power and are suitable for the owners of small flocks, but when several hundred fowls are kept it is necessary to have a machine which is worked by horse or steam or similar power.

As to the value of cut bone for poultry feeding, the United States Department of Agriculture observes that "where fowls are kept in confinement it is necessary to supply some meat food. Finely cut fresh bone from the meat markets is one of the best if not the best kind of meat food for laying hens and young chickens. Tainted bones should be rejected as unfit for food, and the bones should be both fresh and freshly cut before use."

Quantity to be given.—The quantity of fresh bone which can safely be fed to poultry varies with the age and kind of the poultry, and also in accordance with the conditions under which they are kept, and the season of the year. For adult hens in full lay the customary allowance is from half an ounce per bird per diem in summer to one ounce per diem in winter, but experience and results alone can guide the individual as to the proper quantities to feed in the special circumstances in which his fowls happen to be kept. The allowance would naturally be affected by the nature of the other foods given. If these were poor in protein a liberal allowance of bone might be fed, but if rich in protein then it would be inadvisable to supply bone too freely. Fowls kept in small runs where there is a scarcity or complete absence of natural animal foods can be fed a larger allowance of green bone than birds which run at large over a farm. The health of the fowls may, however, be taken as a fairly safe guide, and so long as the fowls keep healthy there is no great danger that too much bone is being fed.

During the moulting time hens and poultry of all kinds ought to be fed liberally on animal food, because the growth of feathers requires plenty of nitrogenous matter, and there is no form in which it can be more effectively and safely fed than in the form of green bone. It is not, therefore, advisable to drop off the supply of animal food as soon as the hens stop laying for the moult.

Green bone has somewhat the same effect on growing chickens that it has on moulting hens. It is, however, necessary to feed bone to young chickens with the utmost care, for their powers of digestion are not very great and are easily upset. Very small quantities may be fed daily, and the important points are to have the bone finely cut and to feed it in a strictly fresh condition. As chickens attain the age of four months or so they can be fed almost as liberally as adult fowls, and from that time forward there is but little danger of bowel trouble when ordinary precautions are taken.

There are two things which militate against the use of green bone amongst poultry-keepers. The first is the difficulty of procuring a regular supply of raw bones, and the second is the labour of cutting them. In remote country districts the nearest village may contain but one butcher's shop, where animals are

killed but once a week. In such places fresh bones cannot probably be procured regularly or often enough, but a supplementary supply may perhaps be obtained from one of the neighbouring towns.

All kinds of bones from the animals which are used for human food may be utilized for fowl feeding. The bones which are hardest to cut are those of the lower parts of the legs of oxen, and also the ribs. The large leg and body bones are comparatively easy to dispose of in the machine, and when such parts as the head are being prepared it is as well first to strip off the adhering meat so that the bone can be more easily reached. The meat may be cut separately in the machine or with a knife or mincer.

Dried Bones.—It sometimes happens that fresh bones cannot be got at all or in sufficient quantities, but that dried bones can easily be procured. It must not be imagined, however, that dried bones will serve as a substitute. Dried bones are practically lime and little more, the animal matter having been extracted from them by cooking or drying. Bone meal can be made from dried bones and is a useful food to supply mineral matter to the system and to make egg shells. Some poultry-keepers burn old bones and break them into small pieces to be used by fowls instead of grit and charcoal.

Other Animal Food.—The best substitute for cut green bone in a ration is fresh butchers' scraps and offal. These contain about the same proportion of protein as green bones, and may, therefore, be fed to fowls in about the quantities advised above. The offal would include heads of sheep, oxen, &c., livers, lights, heart, and blood. All of these, with the exception of blood, can be fed raw, having been finely chopped. But they may also be boiled if it is so desired, and they will still retain full feeding value provided that the water in which they are boiled is mixed with meal as a mash for the birds. Blood must always be cooked, as it seldom agrees with fowls when fed in a raw state, and being rich in albumen it must be fed sparingly. The best way of cooking blood is to put it into a small canvas bag and suspend by means of a cross stick in a large pot of water, in the same way that a plum pudding is cooked. In this way it can be boiled without burning.

Prepared Animal Foods.—There are now in the market very many prepared animal foods which may be fed with profit to poultry, when fresh animal food of the kinds described cannot be easily or cheaply procured. These prepared foods are sold under various trade names, and come to the poultry-keeper conveniently made up in sacks, and in the form of meal or scraps. Convenience in procuring and handling these foods has led many poultry-keepers to give up feeding cut bone and fresh meat to poultry. Their composition, however, varies greatly, and, before using them largely, poultry-keepers would be well advised to get a sample analysed. It is only those which have a large proportion of digestible matter and which are rich in protein that are worth buying at the prices asked.

Feeding.—Owing to the small daily allowance which it is advisable to feed each fowl, it is apparent that concentrated foods ought not to be fed separately, because the stronger birds of the flock would obtain more than their fair share, and on the whole the best way of feeding meat is in the mash. Mash is usually made up in the evening for the next morning's use, and when the different kinds of meal have been mixed nothing is easier than to add the proper allowance of cut bone, meat meal, or other animal food. The only animal food that may be fed separately is dry beef scrap. Many poultry-keepers now feed their fowls entirely on dry stuffs, placing a sack of mixed corn in a hopper which feeds them automatically, and a sack of dried beef scraps in another hopper, and the fowls are allowed to balance their own ration.

Fowls kept in confined runs should have an ample supply of animal food. This is not only necessary in order that they may lay a good number of eggs but also to prevent egg eating and feather pulling. These depraved habits are usually indulged in by fowls which are confined and fed on too carbonaceous a diet. In such conditions, fowls have an insatiable craving for animal food, or, in other words, for more protein; and they strive to satisfy the desire by eating their own eggs and plucking out and swallowing the feathers from each other's bodies. The habit, once acquired, is difficult to cure, but it will be avoided if fowls are fed liberally on animal foods.

H. DE COURCY.

FERTILISERS AND FEEDING STUFFS ACT, 1906.

The Fertilisers and Feeding Stuffs Act, 1906, will come into operation on the 1st of January, 1907. The provisions of the Act, which applies to wholesale as well as retail sales, may be grouped under the three following headings :—

1. Provisions relating to the warranty to be implied on the sale of a fertiliser or feeding stuff ;
2. Provisions relating to taking samples and obtaining analyses ; and
3. Provisions relating to offences, penalties, and legal proceedings.

PROVISIONS RELATING TO THE WARRANTY TO BE IMPLIED ON THE SALE OF A FERTILISER OR FEEDING STUFF.

Warranty of Fertilisers.—Every person who sells for use as a fertiliser of the soil any article which has been subjected to any artificial process in the United Kingdom, or which has been imported from abroad, is required to give to the purchaser an invoice stating the name of the article and what are the respective percentages (if any) of nitrogen, soluble phosphates, insoluble phosphates, and potash contained in the article, and the invoice is to have effect as a warranty by the seller that the actual percentages do not differ from those stated in the invoice beyond the prescribed limits of error.

Warranty of Feeding Stuffs.—Every person who sells for use as food for cattle or poultry any article which has been artificially prepared is required to give to the purchaser an invoice stating the name of the article, and whether it has been prepared from one substance or seed or from more than one substance or seed ; and in the case of any article artificially prepared otherwise than by being mixed, broken, ground, or chopped, what are the respective percentages (if any) of oil and albuminoids contained in the article. The invoice is to have effect as a warranty by the seller as to the facts so stated, except that as respects percentages the invoice is to have effect as a warranty only that the actual percentages do not differ from those stated in the invoice beyond the prescribed limits of error.

Warranty implied by Name or Description of Feeding Stuff.—Where any article sold for use as food for cattle or poultry is

sold under a name or description implying that it is prepared from any particular substance or from any two or more particular substances, or is the product of any particular seed or of any two or more particular seeds, and without indication that it is mixed or compounded with any other substance or seed, there is implied a warranty by the seller that it is pure, that is to say, is prepared from that substance or those substances only, or is a product of that seed or those seeds only.

Warranty implied by the Sale of a Feeding Stuff.—On the sale of any article for use as food for cattle or poultry, there is to be implied a warranty by the seller that the article is suitable for such use.

Warranty implied by Statements made in Invoices, Circulars, or Advertisements.—Any statement by the seller of the percentages of the chemical and other ingredients contained in any article sold for use as a fertiliser of the soil, or of the nutritive and other ingredients contained in any article sold for use as food for cattle or poultry, made after the commencement of the Act in an invoice of such article, or in any circular or advertisement descriptive of such article, is to have effect as a warranty by the seller.

Mixtures prepared at the Request of the Purchaser.—Where an article sold for use as a fertiliser of the soil or as food for cattle or poultry consists of two or more ingredients which have been mixed at the request of the purchaser, it is to be a sufficient compliance with the above provisions with respect to percentages if the invoice contains a statement of percentages with respect to the several ingredients before mixture, and a statement that they have been mixed at the request of the purchaser.

Meaning of Certain Expressions in the Act.—For the purposes of this Act the expression “cattle” means bulls, cows, oxen, heifers, calves, sheep, goats, swine, and horses; and the expressions “soluble” and “insoluble” are defined as meaning soluble and insoluble in water, or, if so specified in the invoice, in a solution of citric acid or other solvent of the prescribed strength; the percentage of soluble phosphates and percentage of insoluble phosphates mean respectively the percentage of tribasic phosphate of lime which has been, and that which has not been, rendered soluble.

PROVISIONS RELATING TO TAKING SAMPLES AND OBTAINING ANALYSES.

Appointment of Analysts.—The Act provides for the appointment of a Chief Agricultural Analyst by the Board of Agriculture and Fisheries, and of Official Agricultural Analysts and Official Samplers by Councils of Counties and County Boroughs.

Joint Appointment.—Councils may concur in a joint appointment of an analyst or sampler, and any Council may contribute towards any expenses incurred by an agricultural body or association in causing samples to be taken for analysis by the agricultural analyst.

The fees for analysis and sampling by official samplers may be fixed by the Council appointing the analyst or sampler.

Analysis of Sample taken by the Purchaser.—Every purchaser of any article used for fertilising the soil or as food for cattle or poultry who has taken a sample thereof within ten days after delivery of the article to him or receipt of the invoice by him, whichever is later, is entitled, on payment of the required fee, to have the sample analysed by the agricultural analyst, and to receive a copy of the certificate of analysis.

Sampling by an Official Sampler.—An official sampler shall, at the request of the purchaser and on payment by him of the required fee, and may without any such request, take a sample for analysis by the agricultural analyst of any such article as aforesaid which has been sold or is exposed or kept for sale. In the case of an article which has been sold, the sample is to be taken before the expiration of ten days after the delivery of the article to the purchaser, or the receipt of the invoice by the purchaser, whichever is later.

Sampling with a View to the Institution of Proceedings.—Where a sample has been taken with a view to the institution of any civil or criminal proceeding, the person taking the sample is to divide the sample into three parts, and to cause each part to be marked, sealed, and fastened up, and is to deliver or send by post two parts to the agricultural analyst and one part to the seller.

The agricultural analyst is to analyse one of the parts of the sample delivered or sent to him and retain the other, and to send

a certificate of his analysis to the person who submitted the sample for analysis, and where that person is not the purchaser of the article also to the purchaser, and in every case to the seller and to such other persons (if any) as may be prescribed, and is to report to the Board of Agriculture and Fisheries the result of any such analysis. If the agricultural analyst does not know the name and address of the seller, he is to send the certificate intended for the seller to the purchaser, to be by him forwarded to the seller.

In any legal proceedings based on a sample which has been taken in the prescribed manner, and divided as above mentioned, the certificate of the analyst is to be taken as evidence, unless the defendant requires the person who made the analysis to be called as a witness. Either party to the proceeding may require, on payment of a fee, the part of the sample retained by the analyst to be submitted to the chief analyst.

Power is given to the Board of Agriculture and Fisheries to make regulations with respect to any matter which under the Act is to be prescribed, and as to the qualifications to be possessed by agricultural analysts and official samplers, as to the manner in which analyses are to be made, as to the manner in which samples are to be taken and dealt with ; and generally for the purpose of carrying the Act into execution.

All samples sent for analysis must be accompanied by the invoice, or a copy thereof, or of such part thereof as is prescribed.

PROVISIONS RELATING TO OFFENCES, PENALTIES, &C.

Section 6 (1) makes the seller of any article for use as a fertiliser of the soil or as food for cattle or poultry liable without prejudice to any civil liability, on summary conviction, for a first offence to a fine not exceeding twenty pounds, and for any subsequent offence to a fine not exceeding fifty pounds, if he commits any of the following offences, namely :—

(a) Fails without reasonable excuse to give, on or before, or as soon as possible after the delivery of the article, the invoice required by the Act ; or

(b) Causes or permits any invoice or description of the article sold by him to be false in any material particular to the prejudice of the purchaser ; or

(c) Sells for use as food for cattle or poultry any article which contains any ingredient deleterious to cattle or poultry, or to which has been added any ingredient worthless for feeding purposes and not disclosed at the time of the sale.

A person is not to be convicted of an offence under paragraph (b) if he proves either—

(i) That he did not know, and could not with reasonable care have ascertained, that the invoice or description was false; or

(ii) That he purchased the article sold with a written warranty or invoice from a person in the United Kingdom, and that that warranty or invoice contained the false statement in question, and that he had no reason to believe at the time when he sold the article that the statement was false, and that he sold the article in the state in which it was when he purchased it.

In any proceeding for an offence under this section it will be no defence to allege that the purchaser, having bought only for analysis, was not prejudiced by the sale.

A prosecution for an offence under this section is not to be instituted except with the consent of the Board of Agriculture and Fisheries, and the Board are not to give such consent until the part of the sample retained by the agricultural analyst has been analysed, and a certificate of analysis given, by the chief analyst.

Penalties are imposed for tampering with any sample taken under the Act, or for obstructing the official sampler.

Subject to the consent of the Board of Agriculture and Fisheries referred to above, a prosecution may be instituted either by the person aggrieved, or by the council of a county or borough, or by any body or association authorized by the Board.

A prosecution for an offence of causing or permitting an invoice or description to be false in any material particular is not to be instituted under the Act—

(a) After the expiration of three months from the date when the invoice was received by the purchaser; nor

(b) Unless a sample for analysis has been taken, and an analysis by the agricultural analyst has been made, and a certificate of analysis has been given, in accordance with regulations made under the Act.

But the proceedings may be taken as well before the court

having jurisdiction in the place where the purchaser of the article to which the invoice or description relates resides or carries on business, as before the court having jurisdiction in the place where the invoice or description was given.

Any person aggrieved by a summary conviction under the Act may appeal to a court of quarter sessions.

Expenses.—The expenses of a county council are to be defrayed as part of their general expenses ; a borough council's expenses will be paid out of the borough fund or borough rate.

Regulations.—The Regulations to be made under the Act are now under the consideration of the Board, see notice on page 504, and will be published in a later number of the *Journal*.

Trials with varieties of wheat have now been carried out for eight years at the Garforth Experimental Farm under the supervision of the Agricultural Department of the University of Leeds. There are five varieties which have been grown during the whole period, and the average results may probably be regarded as affording an indication of their relative cropping powers.

Varieties of Wheat.

	Bushels per acre of Saleable Grain.			
Squarehead Master...	40 $\frac{3}{4}$
Carter's White Standup	38
Webb's Standard Red	37 $\frac{1}{4}$
Scholey's Squarehead	35 $\frac{1}{2}$
Garton's Red King...	34 $\frac{1}{2}$

Browick Grey Chaff gave 39 $\frac{3}{4}$ bushels and Hunter's White 33 $\frac{3}{4}$ bushels as the average of seven years.

The experiment in 1906 was conducted in a field having two classes of soil, viz., medium loam and clay loam, but the plots were so arranged as to participate equally in both kinds of soil. The previous crop was "seeds," which followed a good crop of "Storm King" oats. The "seeds" mixture consisted entirely of clovers, and furnished such excellent grazing for sheep during the summer of 1905 that it was considered inadvisable to give an application of dung for the wheat crop, and the forward growth of the varieties in spring rendered it unnecessary to apply any artificial manures.

The results in 1906, calculated per acre, are given in the following table:—

NAME OF VARIETY.	YIELD PER ACRE.				Approx. Length of Straw Cut, in inches.	Natural Weight per Bushel (lbs.)
	Saleable Bushels (63 lbs.)	Seconds Bushels (63 lbs.)	Total Grain Bushels (63 lbs.)	Straw. Cwts.		
Webb's Standard Red	49 $\frac{1}{4}$	5 $\frac{1}{2}$	54 $\frac{3}{4}$	54 $\frac{1}{4}$	50	61
Rivett's Cone ...	47 $\frac{3}{4}$	6 $\frac{1}{2}$	54 $\frac{1}{4}$	59	53	61
Squarehead Master (1st year) ...	47 $\frac{1}{4}$	6 $\frac{1}{2}$	53 $\frac{3}{4}$	49 $\frac{3}{4}$	49	61 $\frac{1}{2}$
Carter's Red Standup...	47	6 $\frac{1}{2}$	53 $\frac{1}{2}$	50 $\frac{1}{2}$	46	61 $\frac{1}{2}$
„ White „ ...	46 $\frac{1}{4}$	8	54 $\frac{1}{4}$	52 $\frac{1}{4}$	44	60
Garton's Red King ...	45 $\frac{3}{4}$	5	50 $\frac{3}{4}$	50 $\frac{3}{4}$	48	61
Browick Grey Chaff ...	45 $\frac{1}{4}$	7	52 $\frac{1}{4}$	54	48	62 $\frac{1}{2}$
Webb's White Queen	45 $\frac{1}{4}$	4 $\frac{3}{4}$	50	50 $\frac{1}{2}$	48	61 $\frac{1}{2}$
Squarehead Master (8th year) ...	45	6 $\frac{1}{4}$	51 $\frac{1}{4}$	48 $\frac{3}{4}$	47	60
Squarehead Master (2nd year) ...	44 $\frac{1}{4}$	7 $\frac{3}{4}$	52	48	48	61
Webb's New Defiance	43 $\frac{3}{4}$	4 $\frac{3}{4}$	48 $\frac{1}{2}$	49	49	61
Scholey's Squarehead...	41	7 $\frac{1}{4}$	48 $\frac{3}{4}$	48 $\frac{1}{4}$	47	59 $\frac{1}{2}$
Carter's Royal Prize ...	40 $\frac{3}{4}$	7 $\frac{1}{2}$	48 $\frac{1}{4}$	40 $\frac{1}{2}$	46	62
Duluth (Canadian) 3rd year... ..	33 $\frac{1}{4}$	3	36 $\frac{1}{4}$	48 $\frac{3}{4}$	45	61
Red Fife	22 $\frac{1}{4}$	2 $\frac{1}{4}$	24 $\frac{1}{2}$	36 $\frac{1}{2}$	43	60 $\frac{1}{2}$

Of the red wheats the most satisfactory for yield and quality were Standard Red, Squarehead Master, Red Standup, Browick Grey Chaff and Red King. There was little to choose between White Queen and White Standup. The latter on account of its shorter and stiffer straw commends itself for land in good condition.

The tests with Squarehead Master over a series of years seem to show that no great advantage is to be gained from frequent changes of seed.

The Canadian wheat, Duluth, has now been grown for three years in succession, and it is interesting to note that the yield seems to have improved the longer it has been grown, but this may have been due more to the character of the past three seasons than to the influence of acclimatisation.

	YIELD PER ACRE,		
	1904.	1905.	1906.
Saleable Corn (bushels) ...	16 $\frac{1}{2}$	29 $\frac{1}{4}$	33 $\frac{1}{4}$
Seconds „ „ ...	1 $\frac{1}{2}$	$\frac{1}{2}$	3
Total „ „ ...	18	29 $\frac{3}{4}$	36 $\frac{1}{4}$
Straw (cwts.) ...	36	43	48 $\frac{3}{4}$

There is no indication that "Duluth" has lost "strength" and it seems to have gained in size. It is observed in regard to the 1906 sample that if it could be depended upon to mill as well as imported Duluth, *i.e.*, to yield as good a percentage of flour and an equal "strength," the value of the sample would be 31s. per quarter, whilst that of the best English sample shown would range about 28s.

In the course of the experiments in the improvement of wheat by the Homegrown Wheat Committee of the National Association of Millers, it was found that Fife wheat **Red Fife Wheat.** gave variable yields of grain and straw under differing sets of natural conditions, but as it gave such uniformly excellent results as to quality, the Committee deemed it desirable to ascertain, if possible, under what conditions it was likely to succeed as a farmer's wheat. With that object seed was distributed in many parts of England, and although the complete results have not yet been ascertained, the following particulars will be found of interest :—

The ears of Fife are small, but give a yield of grain per acre altogether larger than their appearance in the field would lead anyone to expect. This experience has been so common that it was thought desirable to ascertain its cause. With that object, in a case where Fife and Squarehead Master were grown close together, the number of stems per foot were counted in the stubble of both sorts. As an average of thirty counts in each case, it was found that the Squarehead Master had 29·4 stems per foot, and the Fife 44·8, or 50 per cent. more. It was then thought desirable to ascertain how this particularly thick plant was caused, and it was found that one bushel of Squarehead Master contained about 567,831 grains, and one bushel of Fife 694,983 grains, or 22 per cent. more. For the purposes of this counting samples were drawn from the bulks of the two sorts which had been grown side by side in the same field. Fife wheat is known to tiller well, and it would appear from the foregoing figures, seeing that only 20 to 25 per cent. of the 50 per cent. thicker plant could be accounted for by the smaller

berried seed, that this reputation for good tillering is well deserved. Any person looking at the sorts growing in the field would not suppose that this much greater thickness of plant existed, and the illusion is probably caused by the fact that the Fife straw has very little flag, which also may account for the fact that the straw weighs well and yields so well per acre.

It may be interesting to ascertain whether the sowing of less seed per acre will bring about larger ears of Fife, but it has not seemed to suffer in other respects from the plant being too thick hitherto.

Some growers have reported that Fife wheat was knocked down badly by the severe storms which visited many localities in June, and that its straw is brittle, liable to be broken in threshing. The Homegrown Wheat Committee has realized this tendency to weakness of straw for some time, and has been for some years engaged in remedying the defect by selection and hybridizing. The brittleness is much intensified if the wheat be allowed to get fully or dead ripe. Some at least of the largest growers of the sort have been able by earlier cutting to obtain straw which has been sold at maximum prices. The wheat is one to two weeks earlier than typical English wheats so that on account of its forwardness it was more likely to be damaged by the very severe storm which took place, in the home counties at least, the night following June 28th. The absence of flag should assist it under ordinary circumstances to stand up relatively well. It is worth mentioning in this connection that in the middle of a field of Fife at Addlestone, 18 plots, representing a corresponding number of varieties, were being grown on behalf of the Committee. The storm referred to picked out without exception all the earliest wheats and knocked them perfectly flat to the ground. The Fife, forming the main crop of the field, was not so early as some of the plots, and suffered to a moderate extent only. Squarehead Master in the next field, which was not nearly so forward escaped practically unhurt.

The Committee has not received a complaint, either last winter or at any previous time in its existence, of Fife suffering unduly from winter climatic conditions. The evidence is overwhelmingly in favour of autumn sowing in preference to spring

sowing, although its value as a spring wheat, if such be required, is high.

The quality of the grain is almost invariably superb. Reports received from millers and bakers not actively associated with the Committee, speak in the highest terms of the flour and the bread produced from it. Although the Fife wheat introduced by the Committee has been grown for five consecutive years in England, there is not the slightest evidence of any diminution in strength in the great majority of cases.

In the course of some investigations into red clover (*Trifolium pratense*) in the United States, a Russian variety has been

**A Russian Type
of Red Clover.**

obtained which, according to a Report published by the Bureau of Plant Industry (Bull. No. 95), appears to possess many desirable qualities. The principal difference between this variety and ordinary American red clovers lies in its freedom from hairs on the stem. This is accompanied by other distinctions, such as the much greater succulence of the plants and the finer quality of the hay, the loss due to coarse, woody, uneatable stems being reduced to almost nothing. Cattle, moreover, are less liable to become blown on the hairless variety, and it is evident from the experiments that where a choice is given it is much preferred by cattle. It appears to mature about two weeks later than ordinary American clover, and gives a very heavy yield of exceptional quality for the first cutting. In the experiments conducted in a number of different States, the yield in nearly all cases exceeded that of the domestic strains grown under similar conditions. This in itself is of great importance, but the actual gain in value is chiefly due to the fact that on account of the succulence of the plants, the general quality and texture of the hay is much finer and the percentage of waste is reduced to a minimum. Another point is that leaves are produced much more profusely than on the American forms.

The seed of this hairless clover was obtained by Dr. E. A. Bessey through Mr. H. Goegginger, of Riga, and was produced on

the estate of a German grower near Yeletz in the eastern part of the Orel Government. This grower is stated to have made a practice of saving his own seed, so that this strain has been grown on the same estate for a number of years. The seed itself is, however, indistinguishable from that in common use.

It is considered that the distinction between this variety and common American red clovers entitles it to a special designation, and it is proposed to call it *Trifolium pratense* var. *foliosum*, on account of the general leafiness of the plant and the persistence and number of basal leaves produced. Almost complete lack of hairiness is, perhaps, the most striking distinguishing mark of this form in the field, but the variability in amount of hairiness, differing as it does even in American strains from more or less widely-separated sources, makes this an undesirable quality on which to base a name. The plants have also a more upright habit of growth and branch more freely than the American form, and there are other differences of a more purely botanical character.

In the July number of this *Journal* an account was given of the results of an investigation, conducted at Kew, as to the perpetuation of "Blight" and "Leaf-curl" in potatoes by means of perennial mycelium present in the tubers.

**Potato
Leaf-Curl.**

The details relating to the life-history of "leaf-curl" have now been worked out and will appear in due course. A point of great practical importance in connection with this research is the discovery that "leaf-curl" in potatoes and "black-stripe" in tomatoes are due to the same fungus, *Macrosporium solani*, Cooke. This discovery not only eliminates one supposed parasitic entity, *Macrosporium tomato*, Cooke, but will also tend to check the spread of the disease, as hitherto it was not known that soil infected by producing a crop of diseased potatoes was capable of infecting tomatoes and *vice versa*.

The only source from which natural nitrate of soda is at present obtained is from the deposits in the northern part of the

The Nitrate of Soda Deposits.

Republic of Chili in the Provinces of Tarapaca and Atacama. The district is practically a rainless one, from three to five years sometimes passing without rain, and even when it falls it is in hardly sufficient quantities to penetrate the topmost layer of soil. This fact has an important bearing on the possibility of discovering similar accumulations elsewhere, as nitrate of soda is especially soluble in water, and deposits of this character could only continue to exist in a region such as this.

The nitrate district is a desolate waste, bearing not a trace of vegetation. The surface is usually composed of sand and gypsum, called "*chucha*," beneath which lies a layer of earth and detritus called "*costra*," some 3 ft. to 12 ft. thick. Beneath this lies the nitrate of soda to a depth of from 1 ft. to 12 ft. A large number of different salts are found in the "*caliche*," as the nitrate deposits are called, and in the upper layers. The nitrate is obtained by boring through the upper layers and introducing charges of gunpowder. This is fired by means of a slow match and the explosion enables a considerable area of the "*caliche*" to be reached. It is then loaded into wagons, and conveyed by a light railway to the factory. Here the natural salts are purified by crystallization to produce commercial nitrate of soda containing 95 per cent. nitrate, having $15\frac{1}{2}$ per cent. of nitrogen.

The export trade dates from about 1830. In 1840-44 the average quantity sent abroad annually was 14,640 tons, and by 1870-74 it had increased to 219,125 tons. During the war of 1879-80 between Chili and Peru the export declined; when, however, Chili took possession of the nitrate territory, a very marked growth in the export took place, which averaged 444,185 tons in 1880-84, with the result that the market was overstocked and prices fell. In consequence the producers formed in 1884 a combination for the purpose of regulating the production. This lasted till 1887, and further attempts were made in 1891 and 1896, but failed from a lack of agreement amongst the producers. Increasing competition, however, led finally in 1900 to the formation of the "Nitrate Syndicate" for

a period from 1st April, 1901, to 31st March, 1906, and this has since been renewed for a further three years.

According to Dr. Krische,* the Syndicate does not aim primarily at raising the price of the product, nor does it prescribe any definite price to wholesale or retail dealers ; it is rather a combination of nitrate producers, who agree to limit themselves to a fixed annual quantity for the purpose of avoiding over-production. A committee ascertains the full producing capabilities of each factory, and the whole of the factories agree to keep their production at an agreed percentage below their maximum output. In carrying out their business, and especially in fixing prices, each of the separate factories enjoys practical freedom, and they compete with one another for business without restriction.

In 1904-5 sixty-two firms were included in the Syndicate, the majority of them being English, though three, including two of the largest, were German. The share capital is nearly twenty millions sterling.

The new agreement made in April last was based on an estimated producing capacity of 2,750,000 tons for all the manufacturing plants, each of which agrees to submit to a *pro rata* reduction in its producing capacity to conform to the consumption of the previous year. The production of the current year is fixed at about 1,960,000 tons, as compared with 1,755,000 tons in 1905-6. In this connection, the *Economist* (Oct. 20th, 1906) observes that "there is some reason to think that there will not be a sufficient expansion in the productive power of Chili to enable full advantage to be taken of this increase. Difficulties in connection with the supply of labour appear to constitute a formidable obstacle to the development of the industry, and it is instructive to note that of the authorized quota of 39,000,000 quintals (1,755,000 tons) for 1905-6 only 36,250,000 quintals were shipped."

During the past ten years there has been an increase of about 50 per cent. in the production and consumption of nitrate of soda. According to the estimates published by Messrs. Henry Bath & Son, the consumption was 1,066,220 tons in 1896, 1,338,890 tons in 1900, and 1,543,120 tons in 1905. During the

* *Fühlings Land, Zeit.* 15th Aug. 1906.

five years since the nitrate combination came into existence the average annual supply has been about 1,400,000 tons, while in the preceding five years it was about 1,212,000 tons. Notwithstanding the increase in the production, prices have risen since 1900. Between 1896 to 1899 the average price varied from 7s. 4½d. to 7s. 9d. per cwt., but in 1900 it rose to 8s. 3½d., and by 1905 it reached 10s. 5d. per cwt. The average for each year is given by the above firm as below:—

			s. d.				s. d.
1896	...	...	7 9	1901	...	...	8 10¾
1897	...	...	7 7½	1902	...	...	9 0
1898	...	...	7 4½	1903	...	...	9 2½
1899	...	...	7 6¼	1904	...	...	10 2¼
1900	...	...	8 3½	1905	...	...	10 5

According to the *Mark Lane Express*, Nov. 5th, 1906, the approximate price, free on rail, London, was £11 17s. 6d. per ton, prompt delivery.

Germany is the largest importer, taking, in 1905, 515,520 tons or about one-third of the total consumption. The second place is taken by the United States (345,000 tons), while France and Belgium are also larger customers than this country, which took only a little over 100,000 tons in 1905. The imports into the United Kingdom during the last five years have averaged about 112,000 tons annually.

During the past few years several scientific discoveries have added to the possible sources from which nitrogen for agricultural purposes may be obtained. One

A New Source of Nitrates.

of these, calcium cyanamide, is a product resulting from the absorption of the nitrogen of the atmosphere by calcium carbide, and is now being manufactured and sold in Germany, though the supply at the present time is apparently limited. It is evident, however, from the experiments which have been reported from time to time in this *Journal*, that it approaches very nearly to sulphate of ammonia in its effects. Another method for the

extraction of nitrogen from the air is that discovered by Professor Birkeland and Mr. Eyde, which results in the production of nitrate of lime. Both of these processes, however, necessitate the employment of electricity, which can only be produced economically where cheap water power is available.

Recent investigations by Messrs. Muntz and Lainé* on nitrification in peat have suggested a new source of nitrates which may have some importance for purchasers of nitrogeous manures. Previous investigations had shown that soils rich in organic matter are particularly suitable for the production of nitrates, and this made it probable that peat, the result of the decomposition of vegetable matter in water, and composed almost entirely of carbonaceous material, would afford a favourable basis for the activity of the nitrifying organisms. Peat in various stages of decomposition has been experimented upon with this object. It has been found that when broken into pieces, mixed with lime, and treated with a weak solution of sulphate of ammonia, after the addition of the nitrifying organisms, peat has exhibited an extraordinarily active nitrification, much surpassing that of any materials previously employed.

In earlier experiments, the maximum intensity of nitrification had been obtained by a solution of salts of ammonia acting on animal black. By substituting peat for animal black, the production of nitrate was much more rapid. All kinds of peat proved very effective, but the light and spongy kinds, less advanced in decomposition, were found somewhat better, probably because they allowed a more active circulation of the air, while liquids penetrated them more completely, and the nitrifying organisms were able to act upon the extensive surface presented by the filaments. It was found that the organisms remained on the peat and continued their nitrifying action indefinitely so long as they continued to be fed. The method adopted is to saturate the peat with an ammoniacal solution, with the result that the liquid becomes nitrified. It is allowed to drain through the peat, and the nitrates are obtained by evaporation.

* *Bull. de la Soc. Nat. d'Agric. de France*, No. 6, 1906.

In treating the peat with a solution of sulphate of ammonia, it was found necessary to use a very weak solution ($7\frac{1}{2}$ grams to the litre), which resulted in a solution containing about 1 per cent. of nitrate, a proportion which did not admit of being concentrated economically. But the investigations showed that nitrification continued in solutions heavily charged with nitrate even up to 22 per cent., so that the practice was adopted of adding fresh salts of ammonia to the already nitrified solution and passing it repeatedly through the peat, thus gradually enriching the solution in nitrates. The liquid became more and more charged with nitrate, but not with ammonia, the proportion of which is never allowed to become high enough to interfere with the activity of the nitrifying organisms. The results showed that the liquid contained 8.2 grams per litre on its first passage through the peat, and 41.7 grams per litre after passing through five times. This is said not to be the limit of absorption, but to represent the point of economical extraction.

If this method of manufacturing nitrates were carried out on the peat lands themselves, peat would serve to furnish the material necessary for maintaining the heat of the nitrate bed and for evaporating the liquid.

Messrs. Muntz and Lainé were also led to consider whether peat could not furnish in addition the ammonia necessary for the operation, as it contains from 2 to 3 per cent. of its dry weight of nitrogen. They found, however, that in the ordinary method of treating peat for the distillation of pyroligneous acid and other products, the bulk of the nitrogen was left in the coke residue. By treating the peat in a current of superheated steam instead of by the dry method, they have succeeded in extracting 1.61 to 1.79 per cent. of the nitrogen from peat containing 2.03 per cent. If this method of producing nitrogen proves a commercial success it will add to our manurial resources, whereas the nitrification of sulphate of ammonia by peat is not likely to have any very direct importance for agriculture. Nearly all soils nitrify freely, and the relative prices of sulphate of ammonia and nitrate of soda show that the artificial nitrification of sulphate of ammonia would seldom be a profitable business.

The Government efforts to encourage horse-breeding in Ireland date from 1888, when it was decided to make an annual grant of £5,000 for the improve-

**Improvement of
Live Stock in
Ireland.**

ment of horses and cattle in Ireland. The administration of this sum was entrusted to the Royal Dublin Society, who allocated £3,200 for horse-breeding, which was entirely devoted to the provision of premiums for thoroughbred stallions. These were distributed through the country in accordance with local requirements. This system was continued from 1888 to 1891, when the payment of premiums was discontinued and the money devoted to the free or assisted nomination of mares. The system of nominating mares continued from 1892 to 1900 inclusive. In connection with this system of free nomination there was formed a register of thoroughbred stallions serving in Ireland. In 1900 the Department of Agriculture took over this duty, and the lines laid down by the Royal Dublin Society were followed. The Department were guided by a committee of experts—the Horse-breeding Committee—representing the various horse-breeding interests in Ireland, while application is made to the County Councils every year for suggestions as to future work.

The main objects of the present scheme are to encourage the improvement of horse-breeding in Ireland (1) by inducing stallion owners to keep suitable and sound sires of a high degree of excellence, and (2) by inducing farmers to retain their best young mares for breeding purposes. When arranging the details of the scheme to suit local requirements each County Committee is expected to secure to small farmers as large a share of the resulting benefits as is practicable. The sum to be provided by the Department under this scheme in each county depends upon (1) the amount provided in aid of the scheme by local authorities, (2) the special needs of the locality, and (3) the proportion which the amount of the local contribution bears to the genuine capacity of the locality to contribute. The County Committee, who must be approved by the Department, appoint a secretary who prepares all details of scheme for the County, and an executive sub-committee. The joint fund available under this scheme is applied for the nomination of mares after expenses of administration are defrayed.

1. *Nomination of Mares*.—At certain dates and places to be approved by the Department exhibitions of farmers' mares are held for the purpose of issuing nominations. The mares must be the *bonâ fide* property of a farmer, the valuation of whose holding does not exceed the limit fixed by the County Committee. Preference is given to the best young mares under six years of age. They are selected by a judge appointed by the Department, and must be certified to be free from any hereditary disease by a veterinary surgeon appointed by the same body. No farmer is allowed more than one nomination unless the number of mares selected is insufficient for the completion of the scheme, and the nominations are liable to be forfeited in certain cases. A farmer receiving a nomination must select one of the approved stallions. The value of the nomination fee is uniform for the county, but may vary with the breed of stallion selected, and is not less than £2 or more than £3. If the service fee exceeds the nomination, the owner of the mare must pay the excess to the owner of the stallion. The groom's fee is 2s. 6d. for each nominated mare. A return is made to the Department at the end of the season, and the nomination fees are then paid to the owners of stallions.

2. *Registration of Stallions*.—Owners of thoroughbred, Irish draught, Clydesdale, Shire and half-bred stallions are invited to register their animals for service under the Department's scheme on certain conditions, which include inspection and veterinary examination. Two-year-old stallions are not accepted, and the stallion is expected to serve 20 to 50 nominated mares. A fee is charged for registration.

Where there are districts in which, in the opinion of the Department, there are not sufficient stallions, loans are made for the purpose of purchasing them. One-third of the purchase price must be provided by the applicant, two-thirds being provided by the Department, repayable by five annual instalments together with interest at $2\frac{1}{2}$ per cent. on the balance outstanding. The animal must be insured by the applicant.

Up to 1905 only thoroughbred Clydesdale and Shire horses were eligible for registration, and since 1903 the registration of fresh Clydesdale and Shire stallions has been limited to Ulster, Dublin, Louth, and the district round Cork. This is intended

to check the importation of these breeds, which it is thought would, if too freely imported, impair the reputation of Irish horses. In 1906, in order to provide for districts requiring sires other than thoroughbred, Irish draught and half-bred stallions were included.

The number of stallions registered in 1905 was 229, of which 154 were thoroughbred, 49 Clydesdale, and 26 Shires. Local exhibitions of mares to the number of 214 were held, and 3,503 mares were nominated at a cost of £8,289. Eleven loans were granted.

Although the number of registered stallions has steadily increased since 1901, the number is still inadequate for the purposes of the scheme. It may be noted that the total number of stallions standing in Ireland in 1903 was 2,400, of which 30 per cent. were thoroughbred, leaving 1,700 other than thoroughbred. The owners of these animals were invited to submit them to inspection, but only 494 were offered, and the net result of the inspection was that only twelve animals were passed as sound and suitable. As they were outside the ordinary scheme, premiums of £50 were offered on condition that they served fifty mares at a fee of £1 each. This class of animal has been provided for in the 1906 scheme by the inclusion of Irish draught and half-bred stallions.

Cattle.—Grants are also made for encouraging improvement in the breeds of cattle and pigs. The main objects of the cattle scheme are to improve the dairy and store cattle in Ireland by encouraging the breeding or introduction of pure-bred bulls of a high degree of excellence, and by inducing associations of farmers or persons of means to purchase high-class bulls for the use of small farmers. Money is only granted for this purpose in localities where aid is given either by the local authorities or from other local sources, and the funds are administered by the County Committees.

Premiums are limited to bulls entered or qualified by pedigree for entry in their respective herd-books and not above four years old. Applicants for premiums are required to deposit £2 for each bull, and to undertake to exhibit their animals at an approved show and to retain them in the district till September 1st. The amount of the premium for a high-class bull is £15, or in

the case of Galloway, Kerry, Dexter and Ayrshire bulls £10. Each premium yearling bull is to serve not less than thirty cows each, and all other premium bulls not less than forty cows each, other than those that are the property of the owner of the bull. The service fee for the number of cows stated is in all cases to be 1s. each, inclusive of all charges. After the minimum number of cows have been served the owner may fix such fee as he may desire. Only cows belonging to farmers having holdings rated below a sum fixed by the County Committee are eligible.

The number of premium bulls in 1905 was 800, of which 602 were Shorthorns, 104 Aberdeen Angus, 69 Hereford, and 25 belonged to other breeds. The total sum expended was about £12,000.

Loans for the purchase of bulls were made in 147 cases. The conditions are similar to those for horses.

Swine.—The scheme for encouraging improvement in the breeds of swine is on very similar lines to the cattle scheme. Boars selected for the first year's premium are to be not less than five months nor more than twelve months old, the premium being £5 for the first year and £3 for the second year. Each yearling boar must serve not less than thirty sows, and each two-year-old boar not less than forty sows. The service is 1s. for each sow.

The number of premium boars was 205 in 1905, and £845 was expended in premiums. The Department has made an arrangement with County Committees for the purpose of securing boars, whereby an applicant deposits £2 with the County Committee, the balance of the price of the animal being deducted from the amount of the premium at the end of the season.

Difficulty is still found in procuring suitable boars for the purposes of the scheme, but a number of new herds have been established by breeders in Ireland, and it is hoped that this will in time get over the difficulty.

The Landes-Ökonomie-Kollegium, which is an advisory body composed of members of the Prussian Agricultural Chambers and members nominated by the Prussian Minister of Agriculture, held a meeting in February of the present year,* at which Professor Ostertag dealt with the subject of warble flies, and proposed that the Landes-Ökonomie-Kollegium should support a resolution that the passing of a law in relation to combating the warble fly was not considered advisable. Professor Ostertag then passed in review the life-history of the warble fly and the estimated extent of the damage due to its depredations. The fly, he remarked, appears from June to September, but does not enter the cowsheds. From the time of Virgil it has been stated that when the females swarm and hum round cattle, the latter will become wild and rush about with tail elevated; entering water, if near, to get rid of their instinctively recognized enemy. It is pointed out, however, that this appearance is not due to the warble fly, but to stabbing insects which make painful punctures. It has also been believed that the warble fly pierced the hide of the cattle in order there to deposit her eggs. But it has been shown that it does not attempt to pierce the hide, but with the help of an egg-laying tube or ovipositor attaches its eggs to the hairs. The larvæ from these eggs endeavour to reach the mouth of the animal, in order to complete in the body a life-history, which has many interesting features. In the first place they seek the œsophagus, where they remain and grow for three months; they then creep into the neural canal, and remain another three months, at the end of which, towards spring, they begin to appear under the skin of the animal. Under the hide the larvæ, which are about 28 mm. long and from 12 to 15 mm. broad, produce the so-called warbles, from which they emerge by boring through the hide, pupating, and finally becoming flies.

The harm occasioned by the warble fly can be gathered from its life-history, though it is questionable whether much injury is done to the grazing stock. On the other hand, the value of the meat is diminished by the wandering of the larvæ

* *Landwirtschaftliche Jahrbücher: Zeitschrift für Wissenschaftliche Landwirtschaft, und Archiv des Königlich Preussischen Landes-Ökonomie-Kollegiums*, XXXV. Band. *Ergänzungsband I.*

from the spinal canal to their position under the hide, and from the putrefaction there, and the hide is injured by the holes which are drilled in it at the time the "bots" or maggots leave the host. The latter consideration led the Association of German Tanners (*Verein Deutscher Gerber*) to petition the Imperial Chancellor to pass a law for the purpose of combating the warble fly. In this petition it was pointed out that the leaflet on the warble fly and its prevention and remedy, which had been issued by the Imperial Health Bureau and distributed in thousands, had up to the present apparently been unsuccessful. In the leaflet it was recommended that the larvæ should be removed from the animal affected before they attained maturity, and destroyed. The Association of Tanners remarked that this method would not be followed without compulsion, as it was too troublesome and absorbed too much time, besides which the farmer took no great interest in the matter because the harm done to himself is not provable. The loss to the butchers and tanners is estimated at £300,000 to £400,000 per annum. The Association recommended that in order to compel destruction of the bots in the districts suffering from warble fly infestation, a law should be passed providing for the establishment of a cattle register; compulsory destruction of bots by cattle-owners, according to official regulations; the marking of the warbled animals by means of a number branded on the horns, the number being entered in the register; and yearly revision of the number of cattle. Provision was also to be made for the payment of a fee by the butchers for every branded animal, in order to cover the expenses of registration, branding, &c.

The Landes-Ökonomie-Kollegium brought this petition to the notice of the Chambers of Agriculture, and at the time of Professor Ostertag's report two Chambers had not replied; two others had expressed themselves as being in sympathy with the petition, but all others as decidedly opposed to it. These latter Chambers suggest many reasons against legislation in the matter, among them being (1) the local occurrence of the warble fly; (2) the multiplication of police orders for farmers; (3) the limitation of the freedom of movement of the agriculturist; (4) the difficulty of carrying out the law and the questionableness of the consequences. To such objections

Professor Ostertag adds others, remarking that the carrying out of such a law would occasion hardships which stand in no relation to the desired end ; his chief objection, however, lay in a belief that compulsory measures would accomplish less than voluntary action, for the carrying out of regulations could not take place without powerful machinery of an administrative character. For such reasons Professor Ostertag did not consider legal action was advisable, but believed in encouraging voluntary efforts. In the course of remarks on the harm done, he stated that according to Kühnau the loss owing to cutting away of affected flesh may be between 10s. and 30s. per head. According to Horne, whole carcasses may have to be destroyed and lost to the trade if the larvæ in wandering from the spinal canal to the hide leave dirty-green coloured passages behind them. Director Ruser, of the slaughter-house at Kiel, estimated that 40 to 50 per cent. of all the Holstein cattle which were at pasture were affected with warbles, and according to the returns of the dealers in hides and the tanners, one-fifth to one-seventh of all cattle slaughtered in Germany are warbled.

The attacks of warble flies appear to be unknown where the cattle do not go to pasture until mid-day, and this is usual in most districts of South Germany. This is believed to be largely due to a biological peculiarity of the larvæ, which leave the warbles from early morning up to 8 a.m., and if the cattle still remain in the sheds the larvæ fall on the floor of the cowsheds and are destroyed. The warble fly only occurs naturally in places where the cattle are at pasture from spring onwards both day and night, or where they are driven to pasture in the early morning. To combat the pest then, the life-history, which the warble fly accomplishes as an independent insect and as a parasite, must be interrupted. It has been recommended to rub the cattle with some evil smelling material at the time of egg-laying in order to keep off the flies. Professor Ostertag for several reasons does not approve of this procedure, and says that no case is known to him where good results have been attained by this method. The only useful means of combating the pest is to extract the immature bots from the warbles and destroy them. This may be done by opening the warbles with a sharp knife and removing the bots ; the scar in the hide will heal over smoothly and loss will not occur as is the case when the bots themselves drill

the holes. This procedure should be followed before the cattle go to pasture, and thereafter about every fourteen days. The results are only likely to be good when all owners of cattle in the neighbourhood mutually undertake to remove bots from their stock. It is suggested that here lies a good opening for the Chambers of Agriculture; organizations for the destruction of the bots exist in Denmark, and a similar procedure is recommended by the Chamber of Agriculture for East Prussia.

After certain other gentlemen had offered their remarks and had emphasized the importance of the subject, the motion was put to the meeting and was carried. The resolution in full is given as follows:—

The passing of a law for the purpose of combating the warble fly is not considered advisable. On the other hand, it is strongly urged that the Chambers of Agriculture in those districts which suffer from the warble pest should induce the farmers to take mutual action for the extermination of the warble fly.

The only method of exterminating the warble fly is regularly to remove the bots from the warbles before the cattle go to pasture, and, as far as possible, during the time they are at pasture.

In order to persuade farmers to co-operate heartily for the destruction of warble flies, it is recommended that both in agricultural associations and newspapers, and in country schools, attention should be drawn, verbally and otherwise, to the damage done by these flies.

In order to promote the general removal of the maggots or bots in each district, it is advised that the removal of the bots be recommended by agricultural associations and newspapers each spring before the animals go to pasture.

The warble fly pest occasions each year increasing harm, which is preventable. It is therefore recommended, in order to keep the matter in view, that a short report should be issued every three to five years by the Royal Prussian Landes-Ökonomie-Kollegium, on the position and results of the steps taken by the farmers of Prussia to combat the warble fly.

In connection with the above it may be of interest to reproduce a portion of the information contained in the Board's Leaflet

No. 21 (*Warble Flies*), the life-history referring, however, to *Hypoderma lineata*, while in Professor Ostertag's report *H. bovis* is referred to. The following remarks are quoted from the Leaflet mentioned :—

“The damage caused by these pests is due both to the adult flies and to their larvæ or ‘bots.’ The flies, when on the wing and on the look out for a host on which to deposit their eggs, frighten stock and frequently cause loss amongst ‘in-calf’ cows by making them stampede about the fields. The galloping about is also bad for milch cows, not only because it affects adversely the secretion of milk, but also because of the bruising of the udders due to their striking against the body. The maggots or ‘bots’ living beneath the skin are a source of irritation to the cattle, while there is also loss from hides ruined, by the perforations, for tanning purposes. They also cause loss to the butcher who often finds the flesh beneath the ‘warbled’ areas so altered by the inflammation set up by the parasites that the beef in that region is spoiled. This so-called ‘licked beef’ has a straw-coloured, jelly-like appearance in a newly slaughtered carcass, but turns to a dirty green in a few hours.

“The life-history of *Hypoderma lineata* is as follows :—The fly deposits her eggs upon the hair of the beast, particularly on the legs, just above the hoofs, whence a common name for this fly in America—the heel fly ; but they are also placed elsewhere. The eggs are fastened to the hairs, usually several together ; each egg is firmly attached to the hair by a process which clasps the hair immediately the egg is laid by the female. The animal licks the place where these eggs are placed, and the larvæ hatched from them are carried by the tongue into the mouth. The young maggots, which are spiny, pass into the gullet or œsophagus and soon penetrate its walls. They then moult their skin, becoming smooth, and proceed to wander through the connective tissues of the host and between the skin and flesh to the back, under the hide of which they are at last found. Here they moult again, once more becoming spiny. At this stage they commence to produce considerable irritation, and a swelling arises over them—the warble—which soon becomes perforated by a hole at the summit. The tail end is pointed towards this aperture, the two spiracles or breathing pores situated on it being placed close to the opening. There is now formed much pus, upon which,

together with blood, the larval bot feeds and develops. A last moult takes place before maturity. By means of the spines the maggot makes its way out of the warble-cell and falls to the ground.

"The life-history of *H. bovis* is not known with certainty. It may be the same as *H. lineata*. It is said, however, to lay its eggs on the upper parts of the body. According to Miss Ormerod the maggots from these eggs, aided by mouth hooks and spines, bore directly through the hide. These grow into the mature bots and cause warbles similar to the former species.

"Much good may be done by allowing stock to have plenty of shelter during hot weather, either natural shelter of trees, or artificial shelter formed by rough lodges or sheds.

"The proximity of water, which the stock can enter at will is also useful as a means of warding off the pest.

"The flies may be deterred from laying their eggs by dressing the beasts at intervals of a month, from May to September, with some strong smelling oil or grease. Cart grease and paraffin may be used for this purpose. Another mixture found of benefit is 1 quart of train oil, 4 ozs. of oil of tar, and 4 ozs. of flowers of sulphur.

"If animals are found to be warbled the 'bots' may be squeezed out of the swellings and killed during February, March, and April. The maggots may be very easily extracted by squeezing the warbles with both thumbs, and may then be squashed under foot. This is a better plan than covering the opening of the warble with grease or mercurial ointment, so as to suffocate the bot within."

Reference was made in this *Journal* (June, 1906, p. 167) to the prevalence in County Wexford of a disease in young cattle which was a source of great loss to farmers, and a short account was given of the investigations which were being undertaken. Some suggestions for the prevention of the disease and treatment of the affected animals have now been issued by the Irish Department of Agriculture.

Symptoms of the Disease.—It appears that the disease is usually confined to cattle under two years old, and in the majority of cases it occurs in animals from six to eighteen

Scour and Wasting in Young Cattle in Ireland.

months of age. Outbreaks are almost entirely restricted to the period between October and April. The affected animals at first become unthrifty and gradually waste, and in the later stages a scour appears which may continue until death occurs from sheer exhaustion. In other cases the disease is of a more acute nature, and scouring may take place before wasting is noticeable; when this happens death soon follows.

Prevention.—The administration of drugs to affected animals has not given satisfactory results, and therefore, pending further investigation, the efforts of stock-owners should be directed towards prevention. The treatment that has been adopted with success in County Wexford consists in the isolation of all young calves for the first year. This may be secured by rearing the calves in a clean, airy house, a practice that can be followed successfully, or by keeping them on a special field on which no other cattle are allowed to graze. The best results have been obtained when the calves are grazed on “seeds” or land freshly laid down to grass. If no “seeds” are available, then the special pasture set apart for the young animals should, early in spring, receive a dressing of from two to three tons of lime or 10 cwts. of salt per statute acre.

When the land is known to be infected it should be tilled or dressed as directed above, and grazed only with horses or milk cows for at least one season. Young cattle should be housed at night from September onwards, and should be given a small allowance of cake or barley-meal and ground oats, with hay and roots to supplement the grass.

Treatment of Affected Animals.—It is most important that when the first symptoms of unthriftiness and loss of condition are noticed the cattle should be isolated and well fed. If delay occurs the animals become weaker, and the chances of recovery more remote. The chief object is to maintain the strength of the animal, which should, therefore, be fed liberally on nourishing foods. The diet should consist of a fair allowance of cake and corn, with plenty of good hay and roots. Unfortunately, the investigations have shown that this disease is not confined to County Wexford, and that it is the unsuspected cause of the loss of many animals in other parts of Ireland.

According to Acts No. 13 of 1866, and No. 38 of 1894 any animal arriving by sea is to be inspected by the district veterinary surgeon at the port of Durban.

Live Stock Import Regulations—Natal.*

Such restrictions and quarantine are imposed as may be deemed necessary, and should any animal or animals be found suffering from a contagious or infectious disease they are destroyed.

By Act 27, of 1899, the veterinary surgeon is to give permission for cattle to be landed and despatched to their destination if a certificate is produced, signed by a duly-qualified veterinary surgeon of the country from which the cattle have been despatched to Natal, showing that they have, before being embarked, been submitted to the tuberculin test, and have thereby been proved free from the disease of tuberculosis, and if upon inspection he shall have reason to believe they are free from any disease which might render them unfit to be introduced into Natal. In the absence of a satisfactory certificate as aforesaid, the cattle will be placed in quarantine and submitted to the tuberculin test. If found free from tuberculosis they will be allowed entry. All expenses of inspection, quarantine, &c., shall be borne by the owner of the cattle. The foregoing regulation does not apply to cattle imported solely for purposes of slaughter.

Proclamation No. 81 of 1904 states that healthy swine from the United Kingdom may be allowed to land in Natal, provided that they are certified by a veterinary inspector or surgeon to have come from a district guaranteed to have been free from swine fever for a period of six months prior to the issue of such certificate, and from a farm guaranteed to have been free from swine fever for a period of two years from the same date, and to be free from disease at the time of embarkation. Such pigs must also be passed by an officer of the Natal Veterinary Department.

* Live stock import regulations have been published in this *Journal* for the following countries :—United States, June, 1903, and Sept., 1906 ; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906 ; Canada, March, 1905 ; New South Wales, April, 1905 ; Germany, May, 1905 ; New Zealand, June, 1905 ; South Australia, July, 1905 ; France, August, 1905 ; Belgium, Sept., 1905 ; Uruguay, Oct., 1905 ; Victoria, Nov., 1905 ; Spain, Dec., 1905 ; Queensland, Jan., 1906 ; Western Australia, Feb., 1906 ; Tasmania, March, 1906 ; Transvaal, June, 1906 ; Ceylon and Cape Colony, Sept. 1906 ; Holland and Malta, Oct. 1906.

The Board are informed through the Foreign Office that the importation and transit of cattle, sheep, goats, and pigs from Great Britain into or through Austria can only take place by special permission from the Austrian Ministry of Agriculture. This permission must be obtained in each individual case, and is subject to the special conditions to be laid down by the Ministry of Agriculture. In applying for permission for importation or transit, the country of origin, species, number, and destination of the animals must be indicated, as well as the frontier stations by which they will pass.

**Live Stock
Import Regula-
tions.—Austria-
Hungary.**

There does not appear to be anything to prevent animals imported into Austria on the conditions above mentioned from being subsequently forwarded to Hungary without the necessity for obtaining a further permit from the Hungarian Ministry of Agriculture.

The conditions of the poultry industry in Great Britain are not identical with those of Canada and the United States, but there are many directions in which the practices which have been found successful in the two latter countries may well be considered by the British farmer. With the view of obtaining first-hand information as to the conditions of the poultry business in America, Mr. Edward Brown, of Reading University College, was recently deputed by the National Poultry Organisation Society to visit the Eastern sections of the Dominion and the Republic, and his report gives an interesting and valuable account of the American and Canadian methods of egg production, incubation, feeding, fattening, &c.

**The Poultry
Industry in
America.***

Without attempting to give a complete summary of the report, some of Mr. Brown's conclusions and observations on special points will be of interest.

Mr. Brown considers that the cost of production is less in the United Kingdom than in America, any advantage in respect to

* "Report on the Poultry Industry in America," by Edward Brown, F.L.S. National Poultry Organisation Society, 12, Hanover Square, W. Price 1s.

cheaper land and food being more than balanced by the high price of labour.

Large egg farms appear in some cases to be profitable when conducted upon business principles with sufficient capital, and where in addition to the sale of eggs for market, a trade can also be secured in eggs for hatching, in stock birds, or in day-old chickens, or in combination with fruit culture.

An important point in connection with large poultry farms is the liability of the soil to become tainted, and thus lead to outbreaks of disease among the birds. Owing to the dry hot summers and the long cold winters the activity of the manure is much decreased, and this difficulty is not one which has up to the present received much attention in America, more especially as the abundance of cheap land makes it easy to utilize fresh soil when necessary. American experience proves however, the importance of securing immunity from taint in the soil, either by the adoption of double yards to permanent houses, the ground being alternately used for poultry and cultivated, or by systematic removal to fresh ground.

Mr. Brown considers that the portable house system so largely used in the United Kingdom should be maintained where poultry are a part of the ordinary stock of the farm, but where farmers and others desire to devote part of their land to poultry and make poultry keeping a more important feature, the colony system of Rhode Island is one which might be usefully adopted. Poultry farming has been carried on successfully in Rhode Island for very many years, and within half a dozen miles of Little Compton in every direction there are scores of farms where poultry are kept and raised in large numbers, in fact hundreds of poultry houses can be seen from the roadway in the course of a mile or two. The main object is egg production, though the local breed—Rhode Island Reds—do not appear to be heavy layers. The farms are usually from 60 to 100 acres in extent, consisting of both pasture and arable land. The former is used for feeding stock or is cropped for hay, and the latter is cultivated for grain.

Whilst the number of fowls kept upon these Rhode Island farms is large, and to some extent the methods adopted are intensive, the poultry section is but part of the farming operations.

Almost invariably the poultry houses are small, and there is an entire absence of the large structures seen upon the big poultry farms. Very few incubators are used. Hatching and rearing are almost universally natural, not artificial. This is possible from the fact that early hatching is not attempted, because there is no need to bring out chicks other than at the regular time, generally in April, and the Rhode Island Red is an excellent sitter and mother. The houses are generally 8 ft. by 12 ft. and 6 ft. high, with gabled roofs, and are provided with large windows in front, a 30-in. door, and the usual trap entrance for the hens. Inside they are fitted with perches and nests, and as they have no floor the earth is thickly covered with sea sand. In the majority of cases cattle are kept on the same fields as the fowls, and it is customary to put a rail fence round the houses to keep the stock away from the water vessels and food troughs. Each house is designed to hold thirty-five to forty fowls, and the customary plan is to allow one such house to the acre. But the whole farm is not thus occupied by poultry, for portions are devoted to rearing and others to ordinary cultivation. A case is quoted of a man who had been engaged in the business for fourteen years with satisfactory results. He owned 120 acres of land and kept 1,800 laying hens, so that forty-five acres were used for laying stock. One field which had been occupied by layers for 12 years showed no sign of taint, but stock were fed on it or a crop grown annually. On another farm of sixty-five acres, 1,500 hens were kept. It is considered most important to change the rearing ground for chickens every year, but under the above system no such change is needed for hens. Very large numbers of chickens, however, are reared on comparatively small areas, for instance 1,000 chickens on a field not exceeding $2\frac{1}{2}$ acres.

The point which Mr. Brown emphasizes is that this district proves the practicability of poultry-keeping by farmers upon a much larger scale than has hitherto been attempted in England, as part of the general work of the farm, and that it has proved successful for a long series of years in a large number of cases ; due care, however, has to be paid to avoidance of overstocking and the prevention of tainted soil. It would be advisable to move the flocks on to fresh ground every year or two years, and

after cropping not to use again until the manure is exhausted. Under this system, by the erection of wire-netting fences round the entire range, the fox difficulty would be largely overcome. By this plan areas of land now uncultivated could be profitably occupied, more especially in connection with small holdings in many parts of the country to which it is specially suitable.

American experience also favours the use of houses with fronts made of wire-netting, the improved ventilation leading to better laying, greater vigour, enhanced fertility of the eggs and stronger chickens. Natural methods of hatching and rearing are preferred for the production of breeding stock, but incubators and brooders are found to be essential for supplying laying hens, table chickens, and ducklings.

Two systems of feeding are in vogue in America, which Mr. Brown considers should be tested by British poultry-keepers. One is the "dry mash" method of giving food in the meal form without any added moisture, and the other is the use of hoppers by which food is kept before the birds at all times, so that they eat whenever they like. Neither the United States nor Canada is considered likely to export eggs to British markets for some time to come, but the trade in chickens from the Western States may probably increase to a large extent.

Reference is made to a disease in turkeys known as "black-head," which had a disastrous effect in the Eastern States, and in some parts of Canada. This disease is unknown in Great Britain, and Mr. Brown urges the importance of steps being taken to prevent the introduction of affected birds, by prohibiting the importation of breeding turkeys from Canada and the United States.

Asparagus is one of the most commonly cultivated vegetables in France, and one of the most generally appreciated. In many localities, and particularly round Paris, the production and sale of asparagus has long been an industry of importance, and the district of Argenteuil has given its name to two varieties, the early and late Giant Argenteuil asparagus. M. Philip de Vilmorin in his work "Les Plantes Potagères"

**Asparagus
Growing in
France.**

gives an excellent account of the method of growing asparagus in France, which may be compared with the description of asparagus growing in Brunswick which was given in a recent number of this *Journal* (June, 1906, p. 154).

Whilst there are districts and soils to which asparagus is particularly suited, it is possible to establish successful asparagus beds by proper care and attention on any soil which is not wet or impermeable. Light soils are, however, most suitable.

The plants may be raised from seed by sowing from May to June in good rich soil, well manured in advance, in rows from 8 to 10 in. apart, lightly covering the seed with soil. The seedlings should be thinned to about 2 in. apart and at the end of a month the weaker plants should be removed so as to leave a space of about 4 in. between each. During the rest of the summer and autumn, they should be watered abundantly when necessary and the surface kept loose and friable, great care being taken not to damage the roots. Plants treated in this way will be ready for planting out the following spring, and are likely to give equally good results as two-year-old roots.

In forming the asparagus bed, preference should be given to light soils, but if heavy wet land has to be used it should be thoroughly drained so as to sweeten it to a depth of 2 ft. to 2 ft. 6 in., and every effort made to improve the surface soil by mixing with it sand, leaf-mould and road-sweepings. In Argenteuil and other localities round Paris, the experience of the growers who have brought the cultivation of asparagus to a high degree of perfection, seems to show that the best results may be obtained by manuring and improving the superficial layer of soil in which the asparagus grows, less attention being given to the lower layers where the roots have but little natural tendency to descend, if abundant nourishment is obtainable at the surface. The necessity for trenching more or less deeply depends on the character of the soil, but the points on which success principally depends are the admission of warmth to the root and an abundance of plant food. The root must be placed in a little hollow and only covered with a moderately thick layer of soil during the growing season, when that is absolutely necessary in order to obtain sufficiently long stalks.

There is no absolute rule for the arrangement of the plants ; they may be placed in rows by themselves, or in beds about 4½ ft. wide containing two rows with the plants 2 ft. apart each way. In growing for show purposes the space may be increased.

Planting in trenches was at one time the only method adopted, but now planting in beds is recognized as simpler and less expensive. In the course of March or April at the latest, the soil should be prepared, after having been well dug over and heavily manured during the winter ; the top surface of the beds should be removed to a depth of about 8 inches, the soil being put on the paths. Well rotted dung or some other active manure should then be spread on the top of the bed. The places the crowns are to occupy should then be marked out at the distances previously mentioned, and a little heap of well prepared soil or leaf mould, about 2 in. high, made at each point upon which the crown is placed and firmly pressed down, taking care to spread out the roots all round. The place should be marked by a stick. When all the crowns have been planted, the roots should be covered with vegetable mould or compost, and soil added to bring the bed up to the former level, so that the neck of the asparagus crown is not buried more than 3 to 4 in. and the lower roots themselves not more than 8 in. at the most.

The soil remaining in the paths can be used for earthing up in spring. During the first year, the bed will require repeated cultivation by hoeing and stirring the surface, and watering from time to time. At the beginning of winter, the shoots should be cut off 8 to 11 ins. above the ground ; part of the soil covering the crown should then be removed leaving only a covering of 1 to 1½ in. deep. This is the best time to apply manure. The manures which have been found most effective are well-rotted dung ; town sewerage to which is sometimes added sea-salt ; lime, chalk, marl, &c. ; and sulphate of ammonia, chloride of potash, superphosphate of lime, and nitrate of potash. The following compound manure has been used in conjunction with farmyard manure :—2½ lb. superphosphate of lime, 1 lb. of chloride of potash, 1 lb. nitrate of potash, and ½ lb. sulphate of ammonia per rod.

In the course of March, the crowns are again covered with 2 to 2½ in. of soil from that left in the paths, and a little nitrate of soda is added to encourage growth. The surface is then well levelled and the bed receives the same attention as in the first year. In the autumn of the second year it is well to give fresh manure as was done the previous year.

In the spring of the third year the asparagus should be earthed up by making a mound of earth (taken from the paths) over the crown about 1 ft. above the rest of the bed. This earthing up is intended to furnish the plant with the necessary matter for its healthy development; the reverse operation of uncovering the shoots or buds in the autumn is intended to allow them to rest and to take advantage of the manure which is applied and also to benefit from the sunshine.

If the asparagus bed has been well cared for up to this point, one may begin from the third year to cut asparagus from the strongest plants, two or three from each root, but the crowns do not come into full bearing until the fourth year. In any case, it is very important to gather the asparagus by breaking them at the top of the crown and not by cutting as is often done. It is best to remove the earth and to break the stalk off cleanly with the finger, re-making the mound round the plant. This is the method adopted by the most careful growers round Paris. In that district asparagus is produced from the beginning of April. In order not to spoil the next year's crop, it is best not to prolong the gathering beyond the middle of June for the early Argenteuil variety, though the late variety will last another fortnight.

In the fourth and succeeding years the attention given to the beds remains the same, consisting of cultivation and repeated manuring. It is not absolutely indispensable to manure every year, but the abundance and excellence of the product is always proportionate to the plant food supplied. An asparagus bed well made and well cared for will remain productive for ten years or more.

If a small area is to be planted, the ground should be trenched two spits deep, keeping the bottom spit at the bottom, peeling

**Cultivation of
Raspberries.**

off the turf by a turf-cutter or plough previously, and placing it grass-side downwards between the two spits as the work proceeds. The raspberry canes may then be planted after manure has been applied.

If the area is too large for trenching, and ploughing has to be resorted to, it should be ploughed and subsoiled in October, and early in November broad beans of a good variety for seed purposes might be drilled ; or garden peas for seed purposes might be drilled next spring. When that crop is gathered next summer, the land should be ploughed one furrow deep again, and cultivated and thoroughly cleaned in hot dry weather, burning the rubbish as the work proceeds ; in early autumn the requisite quantity of farmyard manure should be applied, and the land shallow ploughed, or scarified, thus keeping the manure near the surface. The rows of raspberries may be five feet apart. No other crop excepting one row of strawberries should be grown between the rows, or the surface roots of the raspberries will suffer from intermediate cultivation. Edged tools should never be used in cultivating the land after raspberries have been planted. Superlative is a good variety of raspberry. Short stemmed, say 4 ft. standard apple trees may be put in every 4th, 5th, or 6th row of raspberries at 20 ft., 25 ft., or 30 ft. apart, according to the kinds selected, the rows in which they are planted being governed by the distance allowed between the trees in the rows, so that they may be in line all ways when planted.

If strawberries are planted, the proper culture of the raspberries should take precedence.

A preparation which has been found very successful in the United States as a spray for the San José scale and other insects of that type is the lime-sulphur spray. Recently the Washington Experiment Station made a careful investigation into the best method of making this spray, in regard to which

**Lime-Sulphur
Spray.**

a number of different formulas existed, and as a result the following directions have been issued :—Use one pound of lime and one pound of sulphur to every four gallons of spray which is to be made. First, slake the lime, then add the sulphur and enough additional water, so that the mixture will stir easily. Heat the mixture to boiling point, stirring thoroughly all the time. Continue the boiling until the sulphur is all dissolved. This will generally require from half an hour to one hour of brisk boiling. After the sulphur is all in solution add water to complete the required volume and transfer to the spraying tank through a coarse sieve in order to remove any coarse impurities which might clog or injure the spray nozzles.

Strawberry Leaf Spot (*Sphaerella fragariae*, Tul.).—Dark brown spots appear scattered over the surface of the leaf, which gradually increase in size, becoming whitish at the centre and surrounded by a red margin. When this stage is reached the leaf turns yellow and soon dies, and as the disease usually spreads very quickly, much injury follows, more especially when the epidemic occurs early in the season.

Some Strawberry Diseases.

Bordeaux mixture, half the normal strength, should be used on the first indication of the disease. This is important, as when the fruit is set spraying must cease.

As the fungus forms fruit on the decayed leaves, these should be removed, and the most effective method is by burning. In the autumn sprinkle a thin layer of straw over the entire bed and set it on fire ; by such means not only all diseased leaves, but also spores lying on the ground, are destroyed. This may at first sight appear to be a drastic method ; nevertheless, experience has proved it to be highly successful, and followed by a luxuriant growth of healthy and vigorous foliage.

Strawberry Mildew (*Sphaerotheca castagnei*, Lev.).—During recent years strawberry growers have experienced serious loss, due to the presence of a fungus which completely covers the ripe fruit with a dense white mildew. Although usually only noticed by the grower on the fruit, the fungus generally occurs first on the under surface of the leaves, where it is not so con-

spicuous as when growing on the fruit, yet it is only during the early appearance of the fungus on the leaves that remedial measures can be applied with any hope of success, as spraying must cease after the fruit is set. Bordeaux mixture, half the normal strength, may be used, or the foliage should be thoroughly sprinkled when damp with a mixture of one part of quicklime and two parts of flowers of sulphur. Great care should be taken to cover the under surface of the leaves, and the soil should also be treated.

As the strawberry fungus is the same as the one causing hop mildew, care should be taken to prevent the disease passing from one plant to the other.

According to the *Natal Agricultural Gazette* (September 28th, 1906), new regulations have been published under the Plant Diseases Act of 1904. These regulations appear in the form of three Proclamations (Nos. 118, 119, and 120, of 1906), and one Government Notice, No. 449, of 1906.

**Plant Import
Regulations.—
Natal.***

These regulations govern the introduction of plants into the Colony of Natal, both from the neighbouring Colonies and from countries beyond. They have been drawn up in accordance with those of Cape Colony, Orange River Colony, the Transvaal, and Rhodesia, and for all practical purposes the regulations of these Colonies and those of Natal are identical. The regulations of Cape Colony, Rhodesia, and the Transvaal have already appeared in this *Journal*, as noted below,* and, together with those of Natal, can be seen at the offices of the Board. The present regulations supersede those published in the *Journal* for September, 1905.

The Report by Dr. Somerville on the work of the Intelligence Division of the Board of Agriculture during 1905, contains an account of proceedings under the Sale of Food and Drugs Acts, 1875 to 1899; the Merchandise Marks Acts, 1887 to 1894; the Fertilizers and Feeding Stuff Act,

**Report of the
Intelligence
Division.**

* Previous notes as to plant import regulations have appeared in this *Journal* as follows :—Germany, September, 1903; Cape Colony, October, 1904; Transvaal, February, 1905; New Zealand, August, 1904, and June, 1906; Natal, September, 1905; Western Australia, June, 1906; and Rhodesia, October, 1906.

1893; and the Board of Agriculture Act, 1889 (Section 2, Sub-section 3).

The administration of the Sale of Food and Drugs Acts, so far as they relate to agricultural produce, forms the subject of the first section of the Report. Information is given as to the sampling carried out by local authorities, and different methods of sampling are discussed. The question of the prosecution of farmers for the sale of milk said to be genuine though poor in quality, formed the subject of a circular letter to local authorities, and in view of the comments made on this communication, the Board's views on the question are set forth in the Report at considerable length. A number of observations are also made on the administration of the Fertilizers and Feeding Stuffs Act.

An account is given of the action the Board were able to take in the course of the year, in regard to railway rates and facilities. The miscellaneous subjects dealt with in the Division cover a very wide field, and the Report gives particulars of those which appear of general interest, many of which have already been referred to in this *Journal*.

The Board of Agriculture and Fisheries have addressed the following circular letter to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894

The Dogs Act, to 1903 :—
1906.

4, Whitehall Place, S.W.,

27th October, 1906.

SIR,—I am directed by the Board of Agriculture and Fisheries to ask you to be so good as to call the attention of your Local Authority at an early date to the provisions of the Dogs Act, 1906, which will come into operation on the 1st January next.

2. Section two of the Act empowers the Board to make Orders under the Diseases of Animals Acts for the following purposes :—

(a) For prescribing and regulating the wearing by dogs, while in a highway or in a place of public resort, of a collar with the name and address of the owner inscribed on the collar or on a plate or badge attached thereto :

(b) with a view to the prevention of worrying of cattle, for preventing dogs or any class of dogs from straying

during all or any of the hours between sunset and sunrise :
and

(c) for authorising a Local Authority to make Regulations for either of these purposes.

The Orders and Regulations will take effect under the Diseases of Animals Act, 1894, and the Orders may provide that any dog in respect of which an offence is being committed against the Orders may be seized and treated as a stray dog.

3. At the present time the wearing of collars by dogs is in effect enforced in London and several other districts by means of Regulations made under the Rabies Order of 1895, which exempts dogs wearing collars from the requirement of muzzling. In view of the provisions of the new Act, the Board have made an Order entitled the Dogs Order of 1906, of which copies are enclosed, the effect of which is to revoke all existing muzzling regulations as from the 1st January next, and to enable Local Authorities to make regulations directly requiring the wearing of collars by dogs while in a highway or place of public resort. The regulations will not apply to packs of hounds, or to any dog while being used for sporting purposes, or for the capture or destruction of vermin, or for the driving or tending of cattle or sheep. The Local Authorities are empowered to regulate, as well as prescribe, the wearing of collars, and will thus be in a position to extend the exemptions if they think fit. The Order will not come into operation until the 1st January next, but under the Interpretation Act, 1889 (Sec. 37), it is competent for your Local Authority to proceed at once to make regulations to take effect on or after that date.

4. The Board have not in their Order authorised Local Authorities to make regulations for preventing dogs from straying between sunset and sunrise, inasmuch as they think that the most convenient method will be for each Local Authority in Great Britain to consider what action is in their opinion necessary as regards their district, and then to state to the Board whether the circumstances render it desirable that these powers should be put in force in their district, or any part of it, and whether the restrictions should be in force throughout the year or during a part of the year only.

5. Your Local Authority will note the powers entrusted to the police under Section 3 of the new Act, as to the seizure of

stray dogs. The Board rely on the Police Authorities efficiently exercising these powers, and they have therefore included in the above-mentioned Order a provision revoking, as from the 1st January next, Article 10 of the Rabies Order of 1897, by which your Local Authority were required to exercise functions for a similar purpose.

I am, Sir, your obedient Servant,

T. H. ELLIOTT, Secretary.

According to returns furnished to the Board of Trade, this year's corn harvest was, on the whole, gathered in less time than that of 1905, owing to the exceptionally fine weather, which enabled work to proceed with practically no interruption.

Harvest Earnings in 1906.

Comparatively few extra men were engaged, as most of the corn stood up well and was cut by the aid of self-binding machines. A number of day labourers were unable to get harvest engagements. Generally speaking, harvest earnings averaged somewhat less in 1906 than in 1905.

The following Table shows the average cash earnings, exclusive of the value of any food and drink which may have been provided in addition, of men employed on certain farms in the Eastern, Midland, and Southern and South-Western counties of England respectively for the corn harvest of 1906 :—

District.	Number of men employed at Harvest on Farms included in Table.	Average Duration of Harvest.	Average Cash Earnings for Harvest. per man.		
		Working Days.	£	s.	d.
Eastern Counties ...	605	23	7	8	8
Midland Counties ...	365	25	5	16	1
Southern and South Western Counties ...	358	21	4	9	4

It will be seen that the earnings were highest in the Eastern counties, which comprise the great corn-growing counties of Huntingdon, Cambridge, Lincoln, Norfolk, Suffolk and Essex. The payments in these counties ranged from about £6 15s. to £8, though more was earned by some men on piece work in the

Fen districts. In parts of Norfolk and in Suffolk and Essex the usual system of payment is for the labourer to contract with the farmer to perform the harvest work for a fixed sum, irrespective of the number of days occupied. A short harvest, as in 1905 and this year, is thus a profitable one for the labourer, as he gets back to ordinary farm work at weekly wages sooner than in years such as 1902 and 1903, when the harvest was lengthened by unfavourable weather.

In the Midland and in the Southern and South-Western counties the systems of payment are frequently on a time-work basis, so that harvest earnings fluctuate from year to year according to the duration of the harvest, and the longer harvests of 1902 and 1903 would be more favourable to the labourer than the shorter harvests of 1905 and 1906.

The various methods of payment are as follows (apart from that already described for certain Eastern counties):—To give the work in separate portions as piecework; to give the ordinary weekly wages and, in addition, a bonus of a pound or two at the end of harvest; to give extra time wages for a month certain, and then to pay the ordinary weekly wages; to pay double the ordinary weekly wages during harvest; to pay a certain rate per day as long as harvest lasts. Occasionally the ordinary weekly wage is paid and overtime money given.

In addition to cash payments, beer or cider is frequently given, and in some cases light refreshments such as tea, bread, butter and cheese.

The Northern counties have been excluded from the above Table, as the majority of the farm servants in the North are hired by the year or half-year, and paid a regular wage with free board and lodging during the whole of the period for which they are hired, and are given no extra money for harvest, though they are often given extra food and drink. Except in Northumberland and Durham, where the system of engagement closely resembles that in the Border counties of Scotland, the married men attached to the staff of a farm generally get from about £4 to £6 for a month at harvest, some food and drink being frequently given in addition. Extra hands, both English and Irish, in these districts sometimes get rather higher payments than the regular men, and often more food. The Irishmen are usually provided with lodging in barns or outhouses on the farms.

Draft Rules under Fertilisers and Feeding Stuffs Act.—The Board of Agriculture and Fisheries propose at the expiration of forty days from the 8th November, 1906, to make the following rules under the Fertilisers and Feeding Stuffs Act, 1906, viz., Fertilisers and Feeding Stuffs (Limits of Error) Regulations, 1906; Fertilisers and Feeding Stuffs (Sampling, &c.) Regulations, 1906; and Fertilisers and Feeding Stuffs (General) Regulations, 1906. Copies of the draft rules may be obtained on payment of one penny a copy upon application at the Board of Agriculture and Fisheries, 4, Whitehall Place, S.W. A notice to the above effect appeared in the *London Gazette* of the 9th November, 1906.

Fruit Crops and Bird Protection.—A paper will be read at the Society of Arts on Wednesday, December 12th, next, at 8 p.m., on "Fruit Crops and Bird Protection," by Mr. Cecil H. Hooper, M.R.A.C. The lecture will be illustrated by lantern slides of birds that destroy buds, flowers, or fruits, and those that are beneficial in various ways to the fruit grower. Cards of admission may be obtained by persons interested from the Secretary, Society of Arts, John Street, Adelphi, London, W.C.

PRODUCE OF HOPS.

Preliminary Statement showing the ESTIMATED TOTAL PRODUCTION of Hops in the years 1906 and 1905, with the ACREAGE and ESTIMATED AVERAGE YIELD per STATUTE ACRE in each COUNTY OF ENGLAND in which Hops were grown.

COUNTIES, &c.		Estimated Total Produce.		Acreage Returned on 4th June.		Average Yield per Acre.	
		1906.	1905.	1906.	1905.	1906.	1905.
		Cwts.	Cwts.	Acres.	Acres.	Cwts.	Cwts.
KENT	East ...	46,236	135,945	9,863	10,417	4'69	13'05
	Mid ...	50,152	152,044	9,849	10,464	5'09	14'53
	Weald ...	70,243	155,481	9,584	9,774	7'33	15'91
	Total, Kent	166,631	443,470	29,296	30,655	5'69	14'47
HANTS ...		10,263	30,207	1,939	1,978	5'29	15'27
HEREFORD ...		24,953	88,802	6,481	6,851	3'85	12'96
SALOP ...		442	1,626	127	135	3'48	12'04
SURREY ...		3,399	10,248	777	843	4'37	12'16
SUSSEX ...		22,070	69,059	4,379	4,647	5'04	14'86
WORCESTER ...		17,893	51,961	3,672	3,807	4'87	13'65
OTHER COUNTIES*		37	570	51	51	0'72	11'18
Total ...		245,688	695,943	46,722	48,967	5'26	14'21

Gloucester and Suffolk.

ADDITIONS TO THE LIBRARY DURING OCTOBER.

Africa—

Flora Capensis.—*Harvey, W. H., and Sonder, O. W.*—Vol. I. (546 pp.), 1894; Vol. II. (621 pp.), 1894; Vol. III. (633 pp.), 1894. *Thiselton-Dyer, Sir W. T.*—Vol. IV., Sect. I., Pt. I. (192 pp.); Pt. II. (193-336 pp.), 1905; Vol. IV., Sect. II. (479 pp.), 1904; Vol. V., Pt. I. (224 pp.); Vol. VI. (563 pp.), 1896-1897; Vol. VII. (791 pp.), 1897-1900.

Cape of Good Hope.—Report of the Select Committee on Elsengberg. (186 + XXI. pp.) 1906.

Natal.—Secretary, Minister of Agriculture. Report for 1905-6. (32 pp.)

Australasia—

Queensland.—Department of Agriculture and Stock. Report for 1905-6. (149 pp.)

Austria-Hungary—

Jahresbericht über das Veterinärwesen in Ungarn, 1904. (117 pp.) 1906.

Belgium—

Situation de l'Enseignement Vétérinaire et Agricole, 1903, 1904, and 1905. (216 pp.)

Denmark—

Trap, J. P.—Kongeriget Danmark. 5 vols. (1,050 + 980 + 799 + 1,028 + 1,080 pp.) 1898-1906.

France—

Larbalétrier, A.—Les Tourteaux de Graines Oléagineuses comme aliments et engrais. (202 pp.)

Méline, J.—Le Retour à la Terre. (320 pp.) 1906.

Ministère de l'Agriculture.—Notice sur le Commerce des Produits Agricoles. Tome 1^{er}. (462 pp.) 1906.

Germany—

Passon, Dr. M.—Handbuch des Düngewesens. (333 pp.) 1902.

Tilly, Otto von.—Anleitung zur selbständigen Erlernung der Landwirtschaftlichen Buchführung. (204 pp.) 1898.

Disselhorst, R.—Die Anatomie und Physiologie der grossen Haussäugetiere. (386 pp.) 1906.

Statistik des Deutschen Reichs, N.F., Band 112:—Die Landwirtschaft im Deutschen Reich, 1895. (500 pp.) 1898.

Jahresbericht über die Verbreitung von Tierseuchen, 1905. (88 + 210 pp.)

Jahresbericht über die Fortschritte auf dem Gesamtgebiete der Agrikultur-Chemie, 1904. (740 pp.) 1905. (561 pp.)

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 119:—Beiträge zur Kenntnis der Wasserwirtschaft in den Vereinigten Staaten von Amerika. (60 pp. + 21 plates.) 1906.

Heft 120:—Lastkraftwagen in der Landwirtschaft. (136 pp.) 1906.

Heft 121:—Felddüngungsversuche über die Wirkung des Schwefelsauren Ammoniaks gegenüber dem Chilisalpeter. (234 pp.) 1906.

Heft 122:—Vorprüfung neuer Molkereigeräte der Wanderausstellung zu München, 1905. (49 pp.) 1906.

Mayer, A.—Lehrbuch der Agrikulturchemie in Vorlesungen. Dritter Band:—Die Gärungschemie. (248 pp.) 1906.

Lippmann, Prof. Dr. Ed. O. von.—Abhandlungen und Vorträge. (590 pp.) 1906.

K. Biologische Anstalt für Land- und Forstwirtschaft.—5 Band. Heft 4:—Beiträge zur Kenntnis der Fusarien und der von ihnen hervorgerufenen Pflanzenkrankheiten. (155-188 pp.) Sclerotinia Libertiana Fuckel als Schädiger von Wurzelfrüchten. (189-213 pp.) 1906.

Weitz, Dr. M.—Der Chilisalpeter als Düngemittel. (486 pp. + 8 diagrams.) 1905.

Great Britain—

- Various Authors.*—British Birds with their Nests and Eggs. 6 vols. (208 + 192 + 175 + 218 + 178 + 252 pp.) 1898.
Shepherd, E. T.—Practical Farming. (154 pp.)
National Poultry Organisation Society.—Report on the Poultry Industry in America by Ed. Brown. (124 pp.) 1906.
Leeney, H.—Home Doctoring of Animals.
Massee, G.—A Text-Book of Fungi. (427 pp.) 1906.
University of Leeds :—
 Bull. 60. Milk Investigations at the Manor Farm, Garforth, 1905. (21 pp.)
 Bull. 61. Report on a Test of Thirteen Varieties of Wheat at Garforth, 1906. (10 pp.)
Taylor, S.—Inexpensive Rural Cottages and Buildings for Small Holdings. (112 pp.) 1906.

Holland—

- Departement van Landbouw.*—Verslag No. 5, 1905 :—Verslagen der Rijkslandbouwproefstations over 1905-6. (88 pp.)

India—

- Webber, Thos. W.*—The Forests of Upper India. (344 pp.) 1902.
Punjab.—Veterinary College and Civil Veterinary Department. Report for 1905-6. (32 pp.)
Civil Veterinary Department in India.—Report for 1905-6. (45 pp.)
Department of Agriculture.—Memoirs :—Botanical Series, Vol. I., No. 4 :—*Gossypium Obtusifolium*, Roxburgh. (10 pp.) 1906.

Norway—

- Direktør for det Civile Veterinærvæsen.*—Veterinærvæsenet og Kjødkontrollen, 1904. (287 pp.)

United States—

- Winton, A. L.*—The Microscopy of Vegetable Foods. (701 pp.) 1906.
Department of Agriculture.—Year Book, 1905. (815 pp.)
Bureau of Animal Industry :—
 Circ. 98. Some Unusual Host Relations of the Texas Fever Tick. (8 pp.) 1906.
 Bull. 88. The Tuberculin Test of Hogs and Some Methods of their Infection with Tuberculosis. (51 pp.) 1906.
 Bull. 89. Part II. Preventing Molds in Butter Tubs. (13 pp.) 1906.
Forest Service :—
 Circ. 39. Experiments on the Strength of Treated Timber. (31 pp.) 1906.
 Circ. 42. Consumption of Tanbark in 1905. (4 pp.)
Bureau of Plant Industry.—Bull. 95. A New Type of Red Clover. (45 pp. + 3 plates.) 1906.
Office of Public Roads.—Bull. 27. The Construction of Sand-Clay and Burnt-Clay Roads. (19 pp.) 1906.
Bureau of Statistics :—
 Bull. 45. Imports of Farm and Forest Products, 1903-5. (62 pp.)
 Bull. 46. Exports of Farm and Forest Products, 1903-5. (72 pp.)
 Bull. 47. Trade with Non-contiguous Possessions in Farm and Forest Products, 1903-5. (45 pp.)
University of California :—
 Bull. 163. Pear Scab. (18 pp.) 1905.
 Bull. 165. Asparagus and Asparagus Rust in California. (99 pp.) 1905.
 Bull. 172. Further Experience in Asparagus Rust Control. (21 pp.) 1906.
 Bull. 175. Tomato Diseases in California. (16 pp.) 1906.
Kansas Agricultural College :—
 Bull. 137. Variations in the Test of Separator Cream. (205-211 pp.) 1906.
 Bull. 138. Effect of Bacteria in Wash Water of Butter. (212-222 pp.) 1906.
 Bull. 139. The Study of Corn. (223-249 pp.) 1906.

West Indies—

- Imperial Department of Agriculture.*—Reports on the Botanic Station, Agricultural School, and Experiment Plots, St. Lucia, 1905-6. (24 pp.)

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of October, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 3	7 0	36 8	32 11
Herefords	7 7	6 10	—	—
Shorthorns	7 5	6 9	35 9	32 3
Devons	7 9	7 0	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	7 $\frac{3}{4}$	7	8 $\frac{1}{2}$	6 $\frac{3}{4}$
Sheep :—				
Downs	8 $\frac{3}{4}$	8	—	—
Longwools	8 $\frac{1}{2}$	7 $\frac{1}{2}$	—	—
Cheviots	9	8 $\frac{1}{2}$	9	8
Blackfaced	8	7 $\frac{1}{4}$	9	7 $\frac{3}{4}$
Cross-breds	8 $\frac{1}{4}$	8 $\frac{1}{4}$	9 $\frac{1}{4}$	8 $\frac{1}{4}$
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	6 10	6 5	6 7	5 10
Porkers	7 7	7 1	7 0	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 1	17 15	21 11	17 14
„ —Calvers	20 8	17 7	19 4	16 9
Other breeds—In Milk ...	18 5	14 11	18 11	16 2
„ —Calvers	13 10	12 12	17 17	15 0
Calves for Rearing	1 19	1 11	1 19	1 7
Store Cattle :—				
Shorthorns—Yearlings ...	8 10	6 19	9 11	7 15
„ Two-year-olds	12 10	10 18	13 18	11 16
„ Three-year-olds	15 13	13 10	16 0	13 3
Polled Scots—Two-year-olds	—	—	14 7	12 3
Herefords— „	14 19	13 9	—	—
Devons— „	12 5	10 7	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	38 11	33 7	—	—
Scotch Cross-breds	—	—	32 2	27 1
Store Pigs :—				
Under 4 months	29 7	22 4	25 10	19 10

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of October, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	48 6	46 6	46 6	—	55 6*	52 0*
	2nd	46 6	41 0	42 0	—	52 6*	45 0*
Cow and Bull ...	1st	34 0	39 6	39 0	38 0	42 6	41 0
	2nd	—	33 0	33 0	34 6	33 0	33 6
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	47 6	45 0	45 0	45 6	—	48 6
	2nd	44 0	39 0	40 0	41 0	35 0	38 6
Argentine Frozen—							
Hind Quarters ...	1st	34 0	34 0	34 0	34 0	35 0	35 6
Fore „ ...	1st	24 0	25 6	25 6	25 0	25 6	26 0
Argentine Chilled—							
Hind Quarters ...	1st	37 6	38 0	35 6	34 6	—	38 0
Fore „ ...	1st	25 6	26 6	25 6	24 6	—	28 0
American Chilled—							
Hind Quarters ...	1st	55 6	53 6	53 0	53 0	54 0	55 0
Fore „ ...	1st	31 6	32 6	31 6	31 6	34 0	32 6
VEAL :—							
British	1st	69 0	58 6	61 0	66 6	60 6	—
	2nd	59 6	39 6	56 6	62 6	—	—
Foreign	1st	71 0	—	—	—	—	60 6
MUTTON :—							
Scotch	1st	73 0	69 0	73 0	74 0	74 6	72 6
	2nd	67 0	—	68 0	69 6	59 6	58 6
English	1st	69 0	70 6	70 0	69 6	—	—
	2nd	63 6	53 0	66 0	64 0	—	—
U.S.A. and Cana- dian—							
Birkenhead killed.	1st	—	—	58 6	—	—	—
Argentine Frozen ...	1st	31 6	34 0	34 0	34 6	32 6	34 6
Australian „ ...	1st	30 6	32 0	31 0	32 0	32 6	—
New Zealand „ ...	1st	38 0	36 6	37 6	37 6	32 6	—
LAMB :—							
British	1st	—	70 6	—	—	74 6	72 6
	2nd	—	63 0	—	—	62 0	—
New Zealand	1st	46 0	46 6	45 6	45 6	46 6	49 6
Australian	1st	39 0	42 6	39 6	38 6	—	—
Argentine	1st	—	—	—	—	—	—
PORK :—							
British	1st	65 6	70 0	69 6	69 6	58 6	57 6
	2nd	60 6	59 6	64 6	64 6	56 0	51 6
Foreign	1st	63 6	67 6	66 6	66 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (<i>in</i> 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6 ...	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13 ...	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20 ...	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27 ...	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3 ...	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10 ...	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17 ...	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24 ...	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3 ...	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10 ...	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17 ...	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24 ...	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31 ...	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7 ...	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14 ...	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21 ...	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28 ...	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5 ...	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12 ...	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19 ...	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26 ...	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2 ...	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9 ...	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16 ...	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23 ...	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30 ...	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7 ...	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	2
" 14 ...	26	10	32	3	30	5	18	9	23	10	23	8	17	6	19	7	20	4
" 21 ...	27	7	32	2	30	3	18	10	23	7	23	2	17	6	18	11	20	5
" 28 ...	28	0	32	3	30	5	19	9	23	11	22	4	17	10	19	3	20	2
Aug. 4 ...	28	3	31	11	30	9	19	9	22	0	22	1	17	10	18	4	19	3
" 11 ...	28	4	30	5	30	5	19	9	22	5	23	0	17	7	16	11	17	11
" 18 ...	28	8	28	5	29	0	22	5	23	4	24	2	16	7	16	4	17	0
" 25 ...	29	5	27	1	27	9	23	2	23	6	25	0	16	5	15	9	16	10
Sept. 1 ...	30	2	26	11	26	9	25	3	23	5	24	3	16	3	15	9	16	6
" 8 ...	30	0	27	1	26	4	24	10	23	4	24	9	16	1	15	11	16	3
" 15 ...	29	7	26	11	25	11	24	9	23	7	24	3	15	11	16	0	16	1
" 22 ...	29	10	26	8	25	9	25	10	23	10	24	3	15	9	15	11	16	0
" 29 ...	29	10	26	9	25	9	25	5	24	3	24	8	15	8	16	1	16	2
Oct. 6 ...	30	2	26	9	26	1	25	6	24	9	25	0	15	9	16	3	16	3
" 13 ...	30	5	26	11	26	3	25	4	24	10	25	3	15	8	16	6	16	7
" 20 ...	30	4	27	1	26	6	25	5	25	0	24	10	15	11	16	7	16	8
" 27 ...	30	6	27	4	26	7	24	11	24	11	24	10	15	10	16	8	16	10
Nov. 3 ...	30	6	27	10	26	7	25	0	24	9	24	8	16	0	17	1	16	11
" 10 ...	30	3	28	3	26	6	24	6	24	10	24	8	15	11	17	4	17	1
" 17 ...	30	2	28	7			24	5	24	6			16	0	17	8		
" 24 ...	30	5	28	5			24	4	24	6			16	1	17	9		
Dec. 1 ...	30	4	28	8			24	6	24	6			16	2	17	11		
" 8 ...	30	4	28	6			24	4	24	7			16	2	17	11		
" 15 ...	30	4	28	5			24	4	24	5			16	2	17	11		
" 22 ...	30	3	28	4			24	7	24	6			16	1	17	11		
" 29 ...	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and Breslau.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: September...	38 0	38 9	24 0	25 0	20 0	22 6
October ...	38 7	39 2	23 10	25 5	20 2	22 7
Paris: September...	39 5	38 9	24 2	25 5	20 2	22 2
October ...	39 6	40 8	24 2	26 3	20 9	23 1
Belgium: August ...	30 10	29 5	22 4	22 10	20 4	20 10
September ..	29 8	28 3	22 8	23 2	18 11	17 11
Berlin: August ...	37 0	38 0	—	—	19 4	21 7
September...	37 1	38 2	—	—	19 9	21 5
Breslau: August ...	36 5	37 2	23 9	27 4 (brewing) 23 3 (other) 28 8	18 10	24 1
September...	35 1	36 10	25 0	23 3 (brewing) 23 3 (other)	19 2	24 1

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of October, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	28 2	27 8	25 6	26 3	17 10	17 6
Norwich ...	27 1	26 6	24 4	25 1	15 11	16 4
Peterborough ...	26 4	25 8	24 5	24 5	16 2	16 0
Lincoln ...	26 3	25 10	24 11	24 11	16 2	16 2
Doncaster ...	26 5	25 8	23 7	23 9	16 0	16 2
Salisbury ...	27 4	26 11	24 9	24 10	17 0	17 0

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of October, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ..	15 0	13 9	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	116 0	114 0	118 0	115 0	114 6	110 6	116 0	—
Danish	124 0	122 0	125 0	121 0	124 0	120 6	123 6	—
Russian	108 0	103 6	120 6	116 6	102 6	96 6	106 6	98 0
Australian ...	120 6	117 0	—	—	—	—	—	—
New Zealand...	121 0	118 0	—	—	—	—	—	—
CHEESE :—								
British, Cheddar	79 6	76 0	—	—	76 0	72 0	68 0	64 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	75 0	66 0	75 0	70 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	64 0	62 6	64 0	62 0	63 6	62 6	64 0	61 6
BACON :—								
Irish	67 6	64 6	69 6	67 0	67 0	64 6	65 6	63 6
Canadian ...	64 6	63 6	65 6	62 6	65 0	61 6	65 6	63 6
HAMS :—								
Cumberland ...	108 0	105 0	—	—	—	—	—	—
Irish	107 0	103 6	—	—	—	—	104 0	95 6
American (long cut) ...	60 0	58 6	63 0	59 0	62 0	59 6	64 6	62 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	14 9	12 6	—	—	—	—	—	—
Irish	13 1	12 0	11 6	10 6	11 0	9 4	10 8	10 0
Danish	12 6	10 9	12 1	10 6	11 6	10 6	10 11	10 3
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	63 6	53 6	—	—	48 6	43 6	45 0	40 0
Scottish Triumph	—	—	—	—	46 6	41 6	—	—
Up-to-Date ...	67 6	55 0	60 0	50 0	46 6	41 6	45 0	40 0
HAY :—								
Clover... ..	103 0	91 6	84 0	71 6	95 0	70 0	75 6	71 0
Meadow	93 6	82 6	73 0	66 6	—	—	72 0	68 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	111	37	959	680
Swine Slaughtered as diseased or exposed to infection ...	684	136	5,493	3,044
Anthrax:—				
Outbreaks	80	69	755	810
Animals attacked	105	87	1,082	1,114
Glanders (including Farcy):—				
Outbreaks	95	83	918	1,030
Animals attacked	199	136	1,740	1,768
Sheep-Scab:—				
Outbreaks	24	37	332	713

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	OCTOBER.		10 MONTHS ENDED OCTOBER.	
	1906.	1905.	1906.	1905.
Swine-Fever:—				
Outbreaks	3	1	84	135
Swine Slaughtered as diseased or exposed to infection ...	34	5	948	1,403
Anthrax:—				
Outbreaks	—	—	3	3
Animals attacked	—	—	7	5
Glanders (including Farcy):—				
Outbreaks	2	8	8	26
Animals attacked	2	37	16	92
Rabies (number of cases):—				
Dogs	—	—	—	—
Sheep-Scab:—				
Outbreaks	14	11	186	249

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CROSS-BREEDING FOR MUTTON IN THE NORTH OF ENGLAND.

The greater part of the mutton produced in the four northern counties of England is cross-bred, and the same may be said of that fed in the South of Scotland. The chief reasons for this method of breeding prevailing in these districts are to be found in the mountainous character of the country, the long and often severe winters, and the special suitability of the climate for turnip-growing. But, independently of these natural causes, the system is well worth following on account of its profitability. Judging from the rapidly increasing numbers of South of England buyers who in recent years have visited the great autumn sheep auctions of the North in order to purchase cross-bred lambs and draft cross-bred ewes, the remunerative character of these sheep is becoming appreciated even in districts far removed from the Borders.

Mountain Breeds.—All the crosses met with in the North of England have their foundation in the mountain breeds: the Cheviot, on the low and verdant Border hills; the Black-faced mountain (Scotch Black-face), on the higher hills of Scotland, and on the Pennine chain and its spurs running into Northumberland, Cumberland, Durham, and Westmorland; the Herdwick, on the poor mountain land of Cumberland and Westmorland; and the Limestone fell sheep of Westmorland—probably an off-shoot of the Black-faced mountain breed.

Of these the Herdwick is the hardiest—probably the hardiest sheep in existence—and able to get its living all the winter

through on the scanty herbage of the fells, so long as the ground is not covered with frozen snow. Closely following the Herdwick for hardiness are the Black-faced mountain and the Limestone sheep. Without these sheep very little fell farming would be possible, and there would be no means of profitably turning to account the mountain herbage in these districts. But they are small sheep, coarse in the wool, slow in maturing, and too wandering in habit to settle down quietly to feed in small fields and folds; consequently, as distinct breeds, they are not profitable for stocking tillage farms, which are comparatively highly rented, and on which the production of rapidly-maturing lamb and mutton is aimed at and quick returns looked for. On the other hand, all three breeds are renowned for the large proportion of lean meat in the carcase, and for the sweet and fine-grained quality of their flesh. The Cheviot has a fleece of fine quality, and is a much tamer sheep than those just described. It is very compactly made, and yields mutton of the highest quality. Of the pure mountain breeds it is certainly the best adapted for fattening on the lowland farms, though it is small in size.

First Crosses.—When these mountain sheep are crossed with any of the large-sized quick-growing breeds, they produce lambs of excellent quality, quickly maturing, and very profitable, either for the butcher or for breeding from as cross-bred ewes.

For the first cross the Border-Leicester ram is the one most in favour for use on these mountain ewes in Scotland and the North of England. Like all sheep of the long-woolled breeds—Border-Leicester, Leicester, Lincoln, and Cotswold—it carries far too great a proportion of fat in its carcase; but it is a large, early-maturing sheep, with excellent fleece, and begets good-backed lambs that both grow and fatten rapidly. It has also the important recommendation of having a narrow head, which is inherited by the lambs, and so the difficulty to the small mountain ewes of lambing large lambs is not materially increased by its use as sire. Where rams of the Down breeds are used, lambing difficulties and losses are numerous, owing to the large heads of the lambs. South country farmers frequently raise the objection to the Cheviot—

Border-Leicester cross that the flesh is "sappy" and does not keep well, but this is probably through associating this half-bred white-faced sheep with the pure Leicester and other white-faced breeds that carry so much fat. As a matter of fact the Cheviot so satisfactorily corrects the inferior quality of the flesh of the Border-Leicester as to make the cross one of the best mutton carcasses. For several years past the writer has fed these first-cross Cheviot—Border-Leicester lambs on swedes, had them killed and dressed locally, and sent to one of the London



CHEVIOT—BORDER-LEICESTER CROSS EWES ("Half-bred Ewes").

wholesale meat markets, and they have invariably realized by auction in the open market the top mutton prices. There can be no better proof of the quality of these sheep, for the London butchers must be allowed to be the best judges of what is most saleable to their customers in the way of mutton. The following figures give the average results for the past three winters of feeding these sheep on turnips :—

Weight of each hogg (teg) when placed on swedes = 97 lb.
Gain per week for eleven weeks...	... .. = 2½ "
Dressed weight, exclusive of loose fat, (52 per cent. of 124 lb)	= 64½ "	

They received ½ lb. each per day of mixed linseed cake and

oats, with hay and cut swedes *ad lib.* The ewes of this cross are handsome, compact sheep, of good size, with fleeces of the best quality; they inherit the good milking qualities of the Cheviot, are free yearners—seldom bringing single lambs if in good condition at tupping time—and easily fatten while suckling a pair of lambs. Tens of thousands of half-bred lambs and thousands of draft ewes of this cross are sold annually at the autumn store sheep sales of Scotland, a large proportion of which come across the Border, the lambs for winter fattening and the ewes for early lamb-breeding.

The Black-faced—Border-Leicester cross prevails in the adjacent districts of Cumberland and Westmorland, of which the market town of Penrith is the centre. Some thousands of these “grey-faced” lambs and draft ewes, as they are locally named, are sold in the Penrith Auction Mart every autumn. These sheep are not so compact in make as the half-bred white-face just described, nor do they carry wool of such good quality; but for good feeding qualities and high-class mutton, with plenty of lean, they would be difficult to beat. The ewes have the excellent milking qualities of the Black-face, and mostly drop couples. Early lambs of this cross, having a little colour in their faces, take the market well.

For high-lying tillage farms, the Herdwick—Border-Leicester cross sheep are excellent; their mutton is of the very best, they are hardy and good sized and good thrivers, but the ewes are not so prolific as those of the other two crosses, and the fleece is coarser.

A very favourite first cross along the adjacent Westmorland and Yorkshire borders is that of the Black-face—Wensleydale. Sheep of this cross also go by the name of “Grey-faced.” The lambs are rapid growers, and the mutton is of high repute, but they fatten more easily when nearly full-grown than as young lambs; they are therefore better adapted for the mutton market than the lamb market. The Border-Leicester sire certainly scores over the Wensleydale as a producer of fat lambs; but the latter has a special value as a sire for a second cross, as will be noticed later.

Second Crosses.—Coming now to the second cross, the Border-Leicester ram has not much advantage over the rams of other

large breeds in the matter of begetting lambs that come easier to the birth; for the first-cross ewes above described are large and roomy enough to give birth quite naturally to fairly large-headed and wide-shouldered lambs. Rams of the following breeds are used on these half-bred ewes:—Border-Leicester, Oxford Down, Wensleydale, Shropshire Down, Leicester, Lincoln, and latterly Suffolk Down. The first-named was much more largely used than all the others put together; but the Oxford Down, especially on white-faced cross ewes, is



SCOTCH BLACK-FACE—BORDER-LEICESTER CROSS EWES ("Grey-faced Ewes").

coming rapidly into favour, as may be seen from the large and increasing numbers sent in recent years to the great ram sales of the North, at Kelso and elsewhere. The plump, dark-faced close-coated lambs of this Cheviot—Border-Leicester—Oxford cross are great favourites with the butchers, and carry more lean than lambs produced by the use of the Border-Leicester ram a second time; and even on the grey-faced ewes, except for fat lambs, the Wensleydale ram is to be preferred to the Border-Leicester. In fact, the heaviest cross-bred sheep produced in Cumberland and Westmorland are those of the Black-

faced—Border-Leicester—Wensleydale breed. For several years in succession at the Penrith Christmas Fat Stock Show the 1st prize pen of shearling wethers were thus bred. These sheep have averaged 230 lb. live weight, and have realised 84s. each. The following are some of the results in breeding for fat lambs from these first-cross ewes that have been obtained by the writer during the past six years, and illustrate the points under consideration :—The ewes used have been Cheviot—Border-Leicester, Black-face—Border-Leicester, and Black-face—Wensleydale; and the rams Border-Leicester, Oxford Down, and Wensleydale. In the matter of fecundity, the average number of fat lambs actually marketed from the three classes of ewes during the whole time has been 1·7 for each ewe; the number born, of course, was higher than this. The ewes have always been in good condition when the rams have been put to them. Of the three kinds, the Cheviot—Border-Leicesters have dropped the largest number of lambs, often more than were desired in the way of triplets; and the Black-face—Wensleydale the smallest number, though the difference has not been great. The lambing period has practically been the month of March.

1. Twenty Cheviot—Border-Leicester ewes were given respectively to Oxford Down, Wensleydale, and Border-Leicester rams.

Number of lambs by the Oxford	= 36 of which 1 died.
" " " " " Wensleydale	= 36 " " 3 "
" " " " " Border-Leicester	= 34 " " 1 "

From the 1st of May the lambs were weighed weekly, and all that turned $4\frac{1}{2}$ stones of 14 lb. in May, or 5 stones in later months were sold by auction *if fat*. By June 24th—

28 Oxford	cross lambs	had been sold.
20 Wensleydale	" "	" "
19 Border-Leicester	" "	" "

that is 80 per cent. Oxford, and about 60 per cent. of the other two crosses. It will thus be seen that the Oxford-cross lambs matured most quickly, and therefore cost less for "keep." This also allowed the dams of those lambs to be sold off fat more quickly than the other ewes, thereby realizing better prices, and costing less to keep. The following is an analysis of the total results :—

	Average weight. lb.	Average price per live pound.
Oxford-cross lambs	74·8	5d.
Wensleydale-cross lambs	77·2	4½d.
Border-Leicester-cross lambs	75·2	4½d.

The Wensleydale giving a growing rather than a fattening tendency in the very early stages, the lambs had to be kept longer before they were fat, and were in consequence heavier weights for the money. The Border-Leicester-cross lambs had too much Leicester in them, the dams themselves being half Leicester.

2. A Border-Leicester ram was put to seven Cheviot—Border-Leicester ewes, seven Black-face—Border-Leicester ewes, and



SCOTCH BLACK-FACE—WENSLEYDALE CROSS EWES ("Wensleydale Grey-faced Ewes").

seven Black-face—Wensleydale ewes ; a Wensleydale ram was put to a similar lot of ewes of each of these three crosses. As before, the lambs were sold, if fat, at 63 lb. live weight up to the end of May, and 70 lb. in later months.

		No. of lambs.	Average age when sold.	Weight.
Border- Leicester ram	7 Cheviot—Border-Leicester ewes	14	12 weeks	70 lb.
	7 Black-face—Border Leicester „	13	10½ „	70 „
	7 Black face—Wensleydale „	12	13 „	82 „
Wensleydale ram	7 Cheviot—Border-Leicester „	12	13 „	83 „
	7 Black-face—Border-Leicester „	11	14 „	86 „
	7 Black-face—Wensleydale „	11	15 „	90 „

Here it will be noticed that for fat lambs the Border-Leicester

is preferable to the Wensleydale, while for rapidly-growing stores the Wensleydale is to be preferred ; and there will be more lean flesh in those sired by the latter. The lambs from the Black-face—Border-Leicester ewes by the Border-Leicester tup did remarkably well, a couple of early single lambs of this cross being sold fat at 7 weeks old weighing 63 lb. each.

It will be observed that rams of two of the most early-maturing English breeds of sheep have been omitted from the above list, viz., the Hampshire Down and Cotswold. The former has been tried, but is said not to do well in the North, one of the objections being the closeness of the fleece, which is said to hold the wet too long for the rainy Cumberland and Westmorland climate. Its high percentage of lean flesh would be a valuable contribution to the qualities of lambs from Leicester-cross ewes. The Cotswold would not in the same way improve the quality of the flesh.

The pure breeds of sheep kept in the district of which we are speaking, viz., the four northern counties of England and the Border counties of Scotland, are the mountain breeds above named, and a few excellent flocks of pure Border-Leicesters, Oxford Downs, and Wensleydales for the production of rams for crossing purposes.

The breeders of mountain sheep generally sell their draft ewes to the lowland farmer after three lambings to be mated in good time with a Border-Leicester ram for the fourth lambing. These ewes are then sold fat off good pasture as soon after the lambs are sold or weaned as their condition will allow. The earliest of these first-cross lambs may be sold fat as lambs, the remainder of them may be fattened off on turnips as prime hogg (teg) mutton, or wintered well on grass and fattened later for the following summer's mutton market. But the best of the cross-bred ewe lambs are reared for breeding purposes. The wether lambs of the pure mountain breeds are allowed to take their time to grow and fatten on their native fells and do not come into the mutton market except as shearlings or two-shear sheep. A Herdwick two-shear fat wether is the acme of mutton production for quality and flavour.

W. T. LAWRENCE.

EGGS *VERSUS* TABLE POULTRY.

Whether the production of eggs or of chickens for market should be the chief aim of the farmer poultry-keeper can only be determined by a study of the conditions under which he has to work and of the prices realizable, as a farm may be suitable to one branch but not to another. In some counties chickens can be sold at nearly twice the sum they command elsewhere, whilst in all residential and manufacturing districts eggs are constantly in demand at satisfactory prices, though in many of the latter high-class chickens are saleable to a very limited extent only and at poor prices. Hence it is essential for the farmer to modify his operations in accordance with his conditions and with the class of produce which will yield the highest returns. The purely agricultural counties, however favourable they may be to the production of eggs and poultry, are seriously affected by the absence of local demand and by the old-fashioned, roundabout, and expensive system of marketing. Until farmers and producers generally adopt methods more in conformity with modern conditions of life, so as to enable them to compete successfully with producers in the nearer Continental countries, they will fail to obtain an adequate return for their labour, and there will not be accorded that encouragement to poultry-keeping by farmers which would stimulate home production to an enormous extent.

Up to the present time nearly all the finer qualities of poultry consumed in the United Kingdom, are reared within the confines of the British Isles, and only the cheaper grades are imported. France, however, produces as good fowls as Britain, and Belgium nearly as good, but in both, better prices prevail in their own markets than would be paid here. Elsewhere the fowls are not as good as our own, but people of all nations are awakening to the possibilities of this trade.

In respect to eggs it would be satisfactory if as good a report could be given. That the great bulk of foreign eggs are inferior to our own is an accepted fact. Distance means much in relation to eggs, simply because to traverse any distance involves time, and time is fatal to the freshness of an egg. But, in the case of the great mass of home eggs, our system—or want of system—is so ill-suited to our needs that these take

as long to travel from nest to breakfast table, even though they be only a hundred miles apart, as foreign eggs which are produced by the Adriatic Sea, on the banks of the Danube, and in Jutland. Efforts are, however, being made to remedy so unsatisfactory a state of things, but progress in many districts is very slow.

Suitable Soils.—That some soils will produce better eggs than others cannot be questioned any more than that richer milk will be obtained in one place than in another. Pure sand is unfavourable for poultry, but with that exception the nature of the soil need not deter anyone so far as egg production is concerned. The finest quality eggs are met with on moderately heavy soil, on mountain sides, and on the moisture-fed lands salted by the air from the ocean. Wherever grass will grow eggs should be good, and the better the land the better the egg. Some of the heavy lands of the country are not very suitable for fowls, as in low-lying positions they are cold and damp, but they are distinctly better than sand. Fowls on this class of soil should be kept for the production of eggs only. An example of this is to be found on the stronger lands in the corn counties, where egg production is the main objective, for, without knowing the reason, farmers have found that table poultry do not pay nearly so well there as elsewhere. Upon heavier soils, which are naturally colder than the dryer land, chickens do not grow so quickly, and an increased cost of production and an inferior quality of flesh are the results. Moreover, only the hardiest breeds can be kept under such conditions, and they do not excel in meat properties, as they are heavy in bone, and, in many cases, have yellow flesh. Thus the first factor to be considered in comparing the relative advantages of egg production or table poultry is the nature of the soil. Our observations have led to the conclusion that whilst the raising of chickens for market can be successfully attempted upon lighter lands of every description, varying from chalk to the Weald clay, but excluding pure sand, it is much more satisfactory to confine the attention to egg production where the soil is stronger and heavier, and, therefore, cold in its nature. By this statement it is not meant that table chickens must be bred under the first-named conditions, but that there are limitations

in the case of chicken raising which do not exist with egg production. To a smaller extent climate and elevation must also be taken into account. Sheltered positions in every part of Britain, provided that the soil is favourable, are suitable to chicken raising, but on the higher lands, with their lower tem-



BUFF ORPINGTONS.

perature and exposure to wind and rain, egg production is to be recommended. Chickens bred on these lands will be excellent in quality, but they cannot be obtained early enough to secure the highest prices.

Local Prices.—The second factor which must be taken into account is whether eggs or table poultry will be likely to yield the best return. As we have already stated, eggs are in demand at satisfactory prices throughout the residential, manufacturing,

and commercial districts, whereas the finer qualities of table poultry only command the best prices at a few centres. For the moment we may leave the question of the purely agricultural counties, where local consumption is comparatively small, and deal with those areas within or near to which a steady and remunerative sale can be obtained with the minimum of trouble and expense. Under such conditions there can be no doubt that farmers are well advised if they lay themselves out to produce eggs, for these are rapidly turned into money, and the consumption is far and away greater than the local supply. Probably the largest profit is secured by farmers in the neighbourhood of great centres of population who have a milk trade, as they are able to deliver eggs at the same time either direct to the consumer or to retailers. Under such conditions nearly all the intermediate profits and expenses are saved. But even in districts which are too far away from towns to permit of personal delivery prices are well maintained throughout the year, and leave a good margin of profit. In such districts, however, the competition of foreign eggs is very severe, and it is essential that the system adopted shall secure the sale of the eggs whilst they are absolutely new-laid. When that is done the cream of the trade is taken by home supplies. It is where this all-important point is neglected that so much complaint is made as to prices realized. The remedy, however, is largely in the hands of producers themselves.

Supply of Eggs in Winter.—Where production breaks down in this country is in securing an adequate supply of eggs in winter. The time when profit is largest is from September to February, during which period those who serve consumers direct find a great difficulty in meeting requirements, and traders who buy foreign eggs are in an advantageous position. Hence householders, in many cases, prefer to deal at shops rather than buy from those who are unable to serve them continuously throughout the year. Hitherto, in respect to eggs, farmers have not set themselves to solve the problem as they have in the case of milk and butter, and until they do so it will be impossible to secure the full benefits of dealing with consumers. Vendors of milk enter into contracts or other arrangements to supply a given quantity regularly all the year round, and realize that if

they fail to do so they will either have to suffer a penalty or lose their customers. To accomplish this result they must be prepared for a surplus at some seasons which may be sold for what it will command, or made into butter. Profit is made by the regular business done, for the surplus seldom does more than cover its cost. That stage has not yet been reached in the egg supply, and it should be the object of every poultry-keeper so to distribute his produce that the surplus may, to some extent, be transferred from the plentiful to the scarce season.

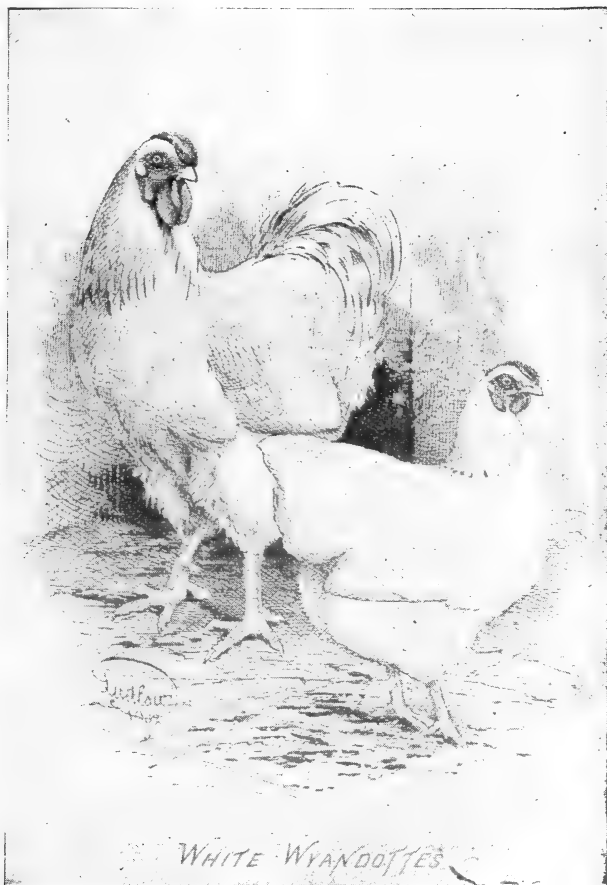
The output of eggs in the winter can be greatly increased by systematically arranging for a succession of young pullets, by hatching at the right period, and by keeping such breeds as are naturally most prolific during the colder months of the year, namely, what are called the "general purpose" fowls. It is only by determined and persistent efforts that good results can be obtained, but the profits well repay the trouble involved. Winter laying cannot be induced by what is called heavy feeding. Under ordinary conditions all fowls are in the plumpest condition during the autumn of the year, owing to the plentiful supply of food available in the late summer, and carry a large amount of fat, which is intended to serve as a source of warmth during the cold weather. By the spring these reserves are exhausted, the body muscles are in hard condition, and the internal organs are active. That is the natural time for hens to commence egg production. What must be aimed at, if we desire hens to lay in the autumn and winter, is that they shall be brought into like condition, or nearly so. The greater the amount of food given at that time the more are the fatty reserves increased, and the process of egg formation is retarded rather than expedited. To accomplish the production of eggs in winter both pullets and hens should be given full liberty; on the richer lands they may be compelled to find all their food for a period limited to three or four weeks, or given only one feed a day, in order to exhaust the reserves of fat, and then be fed on nitrogenous foods in not too great a quantity, encouraging them all the time to forage for themselves. On the College Poultry Farm, Theale, we have found marked results follow the adoption of a sparing diet. Birds in the open fields, even in winter, are given only a half-ration of hot food, that is, half as much as

they would eat, in the morning, with a good feed of corn at night, and nothing more. Such a system assists winter egg production, but the fault of nearly all farmers and poultry-keepers lies in supplying too much food, in giving rich and fatty meals and grains, not only costly in themselves, but preventing abundant laying during the scarce season. Whatever be the method adopted, everyone who goes in for egg production must constantly aim at meeting the winter demand. One egg then may be worth three in the spring, and it entails no more expense, as the hen has to be fed whether she lays or not, and every egg so produced probably means one less when they are plentiful and cheap.

Preservation of Eggs.—It is natural, however, that eggs should be more plentiful during the spring and early summer. In many districts farmers find it better to sell even at moderate rates than attempt preservation. But where there is convenience for storage it is found very profitable to keep eggs until November and December, when, if they have been put down fresh and have been well kept, they can be sold at 50 to 60 per cent. above the spring prices. They should, however, be sold as preserved eggs, and they are decidedly superior for cooking purposes to the box eggs sold in the shops during the winter season. The Board of Agriculture and Fisheries have published a leaflet (No. 83) showing the methods of preservation recommended. Eggs should be perfectly fresh and quite clean when preserved, while they should be carefully tested before they are sold, and kept all the time in a cool place.

Table Poultry.—The production of high-class table poultry, for reasons already stated, cannot be so general as that of eggs, although in every part of the United Kingdom there are districts where chickens could be reared as successfully as in Sussex. The requirements of our best markets can, however, only be met where the work of breeding and rearing is completed by the final process of fattening, which is a highly specialized industry, and one that requires a regular supply of suitable birds. Fattening can be carried out with as much success in the North of England, in the Western counties, in Wales, Scotland, or Ireland, as in the South-Eastern district of England. The great advantage which the last-named has

over other parts of the kingdom is in the quality of the birds obtainable. Many promising efforts to establish fattening centres elsewhere have been seriously handicapped or have failed for that reason alone, and even in Sussex and West Kent the difficulty is to secure a sufficient supply at the seasons when



WHITE WYANDOTTES.

prices are highest. Where such fattening establishments are near by, provided that the conditions are favourable, farmers do well to breed specially to meet their requirements, as they pay prices which leave a substantial profit to the raiser, with the minimum of trouble. This is the experience of the Sussex rearers, who find it more profitable than egg production, in spite of the fact that the demand for eggs in London and on the South coast is much greater than the supply. We cannot

however, recommend poultry-keepers who have a steady and profitable demand for eggs, more especially in the neighbourhood of industrial centres, to abandon that trade for the sake of table poultry, especially as in these districts, with few exceptions, the present demand is for a lower class fowl, and the prices paid would not be remunerative. The development of the trade in fattened chickens should be encouraged in the purely agricultural districts, where eggs are less valuable, and whence both classes of produce must be shipped to the best markets. At the same time it should be recognized that throughout the country there is a large and constant demand for chickens of a lower class, usually sold lean or half-fatted, in which the egg producer can find an outlet for his surplus birds at a fair margin of profit. The lighter-bodied, non-sitting races, such as the white Leghorns, are of small value even for this trade, as they never make size and are lacking in flesh. The "general purpose" breeds, especially those with white legs, of which the Buff Orpington may be taken as an example, are better for this purpose where the soil is not too strong, as they combine winter laying with fair flesh qualities. On heavy lands the yellow-legged breeds of the same class may be recommended.

Sale of Chickens.—Large areas are to be found where table chickens could be produced early in the season, and would command good prices if the sale were systematized, but usually hatching is not commenced early enough. In nearly all the best poultry districts at home and abroad the work of hatching begins in November, and is continued to April or May; whereas, as a rule, farmers do not deem it necessary to begin until March or April, which is time enough for the production of pullets as layers but is too late for chickens. Where early birds are produced much might be done to bring breeders into direct communication with fatteners in other districts, as the latter are generally ready to purchase good specimens at paying rates, provided they can be bulked and forwarded in sufficient quantities. The carriage would be too high for small lots, and the trouble involved more than they would undertake. A partial explanation of the present methods is found in the fact that some of the counties most favourable for chicken raising have within their borders a large number of holiday resorts where there is a

good demand during the summer both for eggs and poultry. There is room, however, for an extension in poultry-keeping which would enable both the spring and summer trade to be met.

Co-operation in the Sale of Eggs.—In respect of eggs, the main difficulty presenting itself is the want of a better organization for sale, and the lack of winter supplies. As to the former, the practice of selling at the weekly markets has entirely broken down in face of the improved and more expeditious system followed by some foreign competitors. It is essential, therefore, that combinations of producers for the sale of eggs should be formed in all the counties which are distant from the point of consumption. The experience gained by the National Poultry Organization Society clearly indicates that Co-operative Societies afford great encouragement to poultry-keeping, owing to the better prices obtained as a result of finer quality and of more regular supplies. A Co-operative Egg Society cannot fail to stimulate production in any district.

EDWARD BROWN.

THE DECLINE IN THE AGRICULTURAL POPULATION.

The reduction in the number of persons returned as engaged in agriculture in Great Britain has been one of the most prominent features of the Census Returns for the past 50 years, and it has never been more apparent than in the figures for 1901, when a decline of about 20 per cent. in the number of agricultural labourers during the preceding decade was indicated.

In view of the public interest displayed in the question of what is termed rural depopulation, the Board determined to take steps to elicit the views of their agricultural correspondents with regard to the present movement of the agricultural population and the causes which affect it. The questions put to the agricultural correspondents included inquiries as to whether the changes recorded in the agricultural population prior to 1901 had continued during the past five years; they were asked for their opinions on the immediate causes of the

decline, and on the desirability or otherwise of providing more allotments or small holdings. Endeavour was also made to ascertain whether temporary and migratory labourers—such as harvesters and hop-pickers, &c.—had declined to the same extent as the agricultural labourers returned in the Census, and how far farmers had tried to meet new conditions by altering their system of farming and developing new or special branches of agriculture. The replies furnished by no fewer than 248 correspondents have been carefully summarised and grouped according to agricultural divisions; and these are followed by appendices exhibiting the changes in agricultural population as revealed by the Census Returns; changes in the area under crops and grass, live stock, and number of holdings, all of which are more or less illustrative of the subject; and the whole is prefaced by an introductory memorandum by Mr. R. H. Rew, in which the various points in the inquiry are discussed.

Continuance of the Decline.—On the whole, the replies indicate that there has been since 1901 a further reduction in the number of men employed on farms, but that the decline is probably proceeding at a slower rate than during the two decades preceding that date. Temporary or migratory labour, however, is generally considered to have decreased in a greater proportion than permanent labour. The monotonous repetition, in tones of varying intensity, of the same story by successive Census Returns has so familiarised the public mind with the process that it has almost come to be accepted as a natural and inevitable course of events. It is perhaps desirable, therefore, to remember that the reductions of the past twenty or thirty years have an importance greater than those recorded previously.

The Position since 1870.—Prior to, say, 1870, there was in many country districts a superfluity of labour, and there is little doubt that a considerable proportion of the agricultural labourers returned as such in the Census were only in partial employment. The elimination of these represented, therefore, a less serious withdrawal of labour from the land than the loss of an equal number at the present time, when employment all the year round is more general. The Elementary Education Act of 1870 powerfully affected the agricultural labourers' position by restricting juvenile labour and diminishing the aggregate amount of the

family earnings, and this combined with other changes about that time paved the way for the agitation of the early "seventies," when for a time capital and labour on the farm organized their forces and came into open, and in some districts bitter, conflict. From this period dates a change in the relationship of masters and men. Agricultural labour attained economic freedom, and if it did not acquire at once quite the same degree of mobility as industrial labour, it became, in the economic sense, fluid. The use of labour-saving machinery spread from the pioneers to the main body of farmers, woman labour was largely diminished, child labour practically disappeared, and a general levelling up of the standard of efficiency pressed hardly upon the casual labourers and the "odd men" of the villages.

At this time—in the "seventies"—farming was prosperous. But from 1879 onwards British agriculture entered upon a new era. Farmers in their struggle with adversity naturally attempted to curtail their labour bill, and became more exigent in their demands upon their men. On both sides the old easy-going attitude disappeared. Masters became more exacting, and men less amenable. Under these circumstances it might have been expected that the differences between capital and labour would have led to a renewal, with even greater intensity, of the fight over wages which characterised the early "seventies." This, however, has not been the case. Small local contests there may have been, but, generally speaking, there seems to have been on both sides a tacit understanding that no substantial or violent change in the level of farm wages was within the field of discussion. Wages have of course fluctuated, though within narrow limits, and slowly but steadily there has been all along a tendency in the direction of increase.

The Cause of Decline.—There is a very large degree of consonance in the varying tones of the reports. The causes assigned naturally fall into two categories, viz.:—(a) those which occasion a diminished demand; and (b) those which account for a reduced supply.

Diminished Demand.—Dealing first with the causes assigned for a smaller demand for labour on the farm, the compulsion put upon farmers to reduce their expenditure by reason of low prices and diminished capital is very commonly referred to.

They have altered their methods of farming so far as possible with the view of economising labour. The most important change, which is referred to in the reports from practically every county from Cornwall to Caithness, is the laying down of land to grass. The loss of 2,000,000 acres of arable land in Great Britain in the twenty years 1881-1901 probably threw out of work from 60,000 to 80,000 labourers at least during that period.

Arable Land and Labour.—It is clear, however, that the withdrawal of the plough from an extent of land as large as Hampshire and Somerset put together, has only partially accounted for the reduction of labour. Indeed, if the figures be examined in local detail, it will be observed that the relation between the decrease of arable land and the diminution of labourers varies greatly, and this is illustrated in the report by several diagrams which show the relative changes which have taken place in the number of labourers and the acreage of arable land, and in the number of cattle and sheep respectively since 1871.

The conclusion arrived at from these figures is that other and perhaps more powerful influences have been affecting agricultural labour than either the laying down of land to grass or the quantity of stock kept in the country. There is little doubt that the saving of labour on the $15\frac{1}{2}$ million acres which in 1901 still remained under the plough was in the aggregate greater during the twenty years than on the two million acres laid down to grass. Many expedients, other than actually stopping the plough, were adopted to reduce the labour bill. But while manual labour has no doubt been economised to some extent by curtailing some of the operations which require it, the main cause of its reduction is undoubtedly the extended use of labour-saving machinery.

Machinery.—With the exception of the self-binding harvester which was introduced into this country in the early "eighties," few machines for the performance of a specific manual operation have been invented since 1881 (unless milking machines, shearing machines, and, perhaps, potato diggers come within that category), but whereas twenty years ago labour-saving machinery was fully employed by comparatively few, it has now

become almost universal on all holdings of sufficient size to make its use practicable. The substitution of mechanical for horse or hand power for fixed machinery, *e.g.*, threshing machines, chaff cutters, pumps, &c., has taken place largely, although it has made, comparatively speaking, little progress for tractive purposes. It may, indeed, be questioned if steam is so largely employed in the cultivation of the land as it was twenty years ago. But the displacement of manual labour arising from the greatly extended use of drills, horse-hoes, mowers, binders, manure distributors, and the like must have been in the aggregate very great, and probably to this more than to any other single cause the reduced demand for farm labourers may be attributed.

It must be remembered, however, that some of the alterations in agricultural practice which have taken place during the past two or three decades have tended to check the reduction of the demand for labour. The increase by nearly half a million in the number of cows and heifers in-milk or in-calf during the past thirty years is an inadequate measure of the great extension of dairying, and particularly of milk selling, which has taken place. The introduction of the centrifugal separator in 1879 and the great improvement which has been made in machinery and appliances for use in dairying have facilitated manual operations and enhanced the value of the produce, although not perhaps actually effecting much saving in the amount of labour required, but the daily milking of so many more cows must have had some influence in maintaining the demand for labour. Although the serious decline in the acreage under hops has, in certain districts, restricted labour, there has been some compensating increase in demand by the extension of the cultivation of fruit and vegetables and "market-garden farming" generally.

Reduced Supply of Labour.—Alongside the influences affecting demand, and more than keeping pace with them, has been the increasing desire of the labourers to leave the land. Most of the reports allude to this impulse, and the varying explanations offered for its existence are interesting. An absolute disinclination for work on the land on any terms is frequently noted as a characteristic of the labouring class, particularly of the younger generation, and complaints that the methods of education in the rural elementary schools foster this distaste are made in many of

the reports. But while simple restlessness or mere rebellion against the conditions of their environment may induce the more active-minded youth of the countryside to seek fortune elsewhere, it is admitted generally that the higher wages and superior social advantages afforded by employment in other industries and the attraction of town life, lead, in very many cases, to a deliberate and calculated abandonment of rural labour. Some correspondents allude to the fact that the higher wages of the towns do not necessarily imply an improved financial position, as the additional expense of living more than counterbalances the additional income. This is no doubt true, but it does not materially affect the position so long as the men are actually attracted by the prospect of "handling more money."

Cottages.—Among specific causes of discontent, a deficiency of adequate or satisfactory housing accommodation is reported from about thirty counties. Speaking generally, there is evidence not only—or perhaps it should be said not so much—of an actual scarcity of cottages, though this is mentioned in some cases, as of a lack of cottages which satisfy the more exigent requirements of the labourers in these times, or comply with the demands of vigilant sanitary authorities. As with every other class, the rural labourers' standard of comfort has been raised, and they are not now contented with the accommodation which previous generations placidly accepted. The recognition of this fact merely states the problem without helping to its solution, which, as several correspondents admit, is extremely difficult, its initial difficulty being that rural cottages are not let at commercial rents. As a part of the labourer's wages is, in effect, now given in house rent, so the provision of more expensive and commodious cottages may be regarded as equivalent to a rise of wages, at any rate from the employer's point of view.

Lack of Incentive.—Many correspondents refer to the absence of an incentive to remain on the land and of any reasonable prospect of advancement in life, and it is mentioned that in some districts, particularly in Scotland, many of the best men have been attracted to the Colonies, where their energies may find wider scope and where the road to independence and a competency is broader and more easy of access. It is, indeed, impossible not to recognise that the ordinary career of the

agricultural labourer offers little scope for ambition. If he is intelligent and quick-witted he may practically have become a master of his craft by the time he is twenty-one, but after rising to the position of horse-keeper or shepherd, or perhaps foreman, there is little further outlook and small hope of increased wages. It is not surprising that in many cases he declines to settle down for life in a calling which does not in the ordinary course provide possibilities of advancement to an independent position.

Desire for Land.—Advancement to the man who lives by the land means in the end the occupation or the ownership of land for himself, and the presence or absence of a reasonable prospect of attaining this goal must no doubt affect the willingness of young and enterprising men to persevere in farm work. The recognition of this fact led the Board to make specific enquiry as to the existence of difficulty in obtaining land for allotments and small holdings.

Allotments.—So far as allotments are concerned, there is a very general consensus of opinion that requirements are as a rule well satisfied. In not more than some half a dozen counties—differing as widely as Hertfordshire, the East Riding, Denbigh and Caithness—is a scarcity of available allotments mentioned. From the large majority of counties, it is reported that there is no difficulty in obtaining all the allotments wanted, while in many cases it is stated that the demand for them is less than it used to be and that frequently they have been given up by labourers who at one time held them. The opinion is expressed by several correspondents that the attachment of a good garden to a labourer's cottage is more desirable and more highly appreciated by the labourer than an allotment which may be at some distance from his home. The provision of an adequate amount of garden ground attached to every labourer's cottage is advocated by many correspondents.

Small Holdings.—The term "small holding" receives a different interpretation in different districts. In some instances it is used almost as if it were synonymous with an allotment or with occupations of not more than half a dozen acres. In other cases it is extended so as to include what in many parts of the country would be considered large farms.

The definition of a small holding which is generally accepted,

is such an area of land as is sufficient to employ the whole labour of a man and his family and not enough to necessitate the employment of hired labour. This may be as little as five acres, or even less where intensive cultivation or market gardening is practised (especially where glass is used), while in grass or mixed farming from 40 to 60 acres may be required. The limits adopted in the Small Holdings Act, viz., land which exceeds one acre and does not exceed 50 acres, may be accepted for present purposes, the more so as statistics are available showing the number of holdings within those limits. It may be allowed that a considerable proportion, probably the majority, of holdings of five acres and less are occupied by persons whose principal avocation is not farming; but even if the whole of this category were ignored, the existence of nearly a quarter of a million holdings from five to 50 acres, or little short of half the total number, provides ample evidence that small holdings constitute a very important factor in the utilization of the land of Great Britain.

Demand for Small Holdings.—The reports are very diverse in their indications of a demand for small holdings and the extent to which its non-satisfaction has affected "rural depopulation." From about a score of counties it is reported that small holdings are little in request, or at any rate that no specific instance of a desire to obtain a small holding has come under the notice of the correspondent. It is possible, of course, that an apparent absence of demand may be due, to some extent at least, to the recognition of the futility of asking for what is practically unobtainable; but at the same time there is certainly some evidence of a disinclination among those who have been brought up on the land to undertake the risks of farming.

Deficient Supply of Small Holdings.—The majority of the correspondents, however, report that there is a demand for small holdings, which is not satisfied for reasons which many of them specify. The belief that their provision would tend to keep the population on the land is expressed in many reports. One correspondent in the East Riding puts the case succinctly:—"It is absolutely necessary that those employed in farm work should have a prospect of rising by their own thrift and perseverance; for this purpose there should be cottages without land for the

older people, cottages with gardens and allotments, and also small holdings from 10 to 50 acres." Some correspondents express doubts as to whether an increase of the rural population would in all cases result from the cutting up of farms.

Difficulties in providing Small Holdings. — While the advantages of small holdings as an incentive to the younger and more desirable class of men to remain on the land are generally recognised, the difficulties of providing them are forcibly referred to by many correspondents. Various obstacles are mentioned, but that which may be said to overshadow all the rest is the cost of equipment. The difficulty, as one report says, "is not in obtaining land, but in the cost of putting up the requisite buildings," or in another phrase, "the essential difficulty is the cost of erecting buildings meeting the modern requirements of sanitary authorities and the prospect of insufficient return in the shape of rent." The greatly increased outlay on the house alone, as compared with former times, is commented on. Allusion is made by several correspondents to the fact that the rents of small holdings are high in comparison with those of medium or large farms, and the cost of equipment is referred to as one of the causes. The capital outlay involved necessarily works out at a higher sum per acre on a small area than on a large one; and except by the provision of cheaper capital or by the erection of a less durable house and buildings in the one case than in the other, it is difficult to see how this inequality can be avoided. The higher rents of small holdings are also sometimes attributable, as frequently pointed out, to other causes, such as proximity to markets, advantages of soil and situation, as well as to the fact that the smaller the amount of working capital required, the wider is the competition for farms.

Conditions of Success. — The conditions which conduce to the success of small holdings, as well also as those which lead to their failure, are indicated in many of the reports. Instances of failure, both of old-established small holdings and of some which have been recently laid out, may be found. An example of the former is given by the late Mr. Punchard, in Westmorland, where holdings of 15 to 30 acres were formerly held in connection with village industries. "With the loss of these industries, and therewith the loss of casual employment

in the way of carting, &c., the small holder had no opportunity of augmenting his income, whilst the profits from the land itself also dwindled so that they were not sufficient by themselves to maintain the man and his family." Analogous cases may be found where small holdings were originally held by miners in a district where the mines have now ceased to be worked. Such examples would appear to emphasise the necessity, to which frequent reference is made, of insuring, in any attempt to establish small holdings, that the local conditions afford a reasonable chance of success. It appears generally that where small holdings have survived, or been successfully established, some local condition exists—whether of a rich or easily worked soil, easy accessibility to good markets, opportunities for supplementary employment or other like advantage—which seems under present circumstances, essential to their maintenance.

Conclusion.—The general tenour of the replies is not optimistic, and the picture drawn of the state of agriculture is, on the whole, somewhat gloomy. If encouragement for the future is to be found anywhere, it is contained in the evidence furnished of the extent to which farmers have adapted themselves to the times by taking up the cultivation of fruit and vegetables, the rearing of poultry, and other industries of a so-called subsidiary character. The extension of dairy-farming, by which the home producers have met the ever-increasing requirements for milk, is perhaps the most striking example of their enterprise, but not only for the sake of retaining labour on the land, but also in the interests of agriculture generally; the evidence of the attention given to what used to be thought "small things" may be regarded as one of the hopeful facts which the present enquiry has elicited.

THE BRITISH CROPS OF 1906.

A preliminary statement of the estimated yield of the principal crops in Great Britain was issued on November 19th. The average produce per acre in the present year of each of the crops for which estimates are obtained is given in the following table, which shows also the excess or deficiency

compared with the average of the preceding ten years' harvests :—

Crop.	Yield per Acre in 1906.	Difference from—	
		Yield in 1905.	Average Yield of 1896-1905.
	Bush.	Bush.	Bush.
Wheat	33'66	+ 0'88	+ 2'44
Barley	34'58	+ 0'67	+ 1'54
Oats... ..	40'55	+ 2'39	+ 1'63
Beans	34'73	+ 2'45	+ 6'14
Peas... ..	30'21	+ 4'50	+ 3'60
	Tons.	Tons.	Tons.
Potatoes	6'06	- 0'12	+ 0'28
Turnips and Swedes	14'22	+ 0'48	+ 1'26
Mangold	19'79	- 0'53	+ 1'09
	Cwts.	Cwts.	Cwts.
Hay, from Clover, &c.	29'21	+ 0'49	+ 0'15
Hay, from Permanent Grass	22'51	+ 0'80	- 0'98
Hops... ..	5'26	- 8'95	- 3'86

From this table it appears that the only considerable deficiency is to be found in hops, the crop of 1906 falling short of the average by nearly 4 cwt. per acre, or over 40 per cent. All the remaining crops, with the single exception of hay mown from permanent grass, however, gave a yield above the average.

Considering the results more in detail, the following table shows the total production and yield per acre in Great Britain of each of the cereal and pulse crops during the past two seasons :—

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1896-1905.
	1906.	1905.	1906.	1905.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
Wheat	59,091,772	58,902,499	33'66	32'78	31'22
Barley	60,553,977	58,110,064	34'58	33'91	33'04
Oats	123,383,857	116,436,887	40'55	38'16	38'92
Beans	9,970,892	8,201,730	34'73	32'28	28'59
Peas	4,515,783	4,439,483	30'21	25'71	26'61

The total production of wheat shows only a slight advance over last year's figure, a somewhat diminished area tending to counteract the increased yield per acre. Compared with the

ten years' average, the yield shows an excess of nearly $2\frac{1}{2}$ bushels per acre, a result in which all three divisions of the country shared, and in this latter respect wheat may be considered as the best of the cereal crops this year.

The production of barley exceeds that of 1905 by nearly $2\frac{1}{2}$ million bushels, in spite of a falling off of nearly half a million bushels in Scotland. There the yield per acre falls short of the average by $1\frac{1}{2}$ bushels per acre, but in both England and Wales the crop is very nearly 2 bushels per acre above the average.

Nearly 7,000,000 bushels more oats have been harvested than in 1905, and the yield per acre is over $1\frac{1}{2}$ bushels higher than the ten years' average. Here, again, a distinction must be drawn, for while in England the yield is $2\frac{1}{2}$ bushels, and in Wales as much as $4\frac{3}{4}$ bushels, above the average, Scotland shows a deficiency of a bushel per acre from the standard, and a decline of a million and a quarter bushels as compared with last year's total crop.

Beans and peas present several features in common. In both cases practically the whole of the crop is grown in England (96 per cent. of the beans and 99 per cent. of the peas), so that the results indicated in the foregoing table are practically identical with those obtained in England alone. Both crops show yields much in excess of the average beans to the extent of more than 6 bushels, and peas more than $3\frac{1}{2}$ bushels per acre. In each case the highest recorded yield per acre, that of 1890, is now surpassed, beans exceeding that year's average by 2 bushels, and peas by $1\frac{1}{2}$ bushels per acre. The total produce of beans is considerably above even last year's unusually high figure, while peas, on a considerably reduced acreage, show an increase in the total production as compared with 1905.

The yield of potatoes is a full quarter of a ton above the average, but the total produce shows some reduction as compared with 1905, owing to the decrease in the area planted this year; it must be remembered, too, that last year's total crop was the largest recorded. Wales alone shows a deficiency in the yield per acre, and that only to the extent of one-third of a ton.

The total produce and yield per acre of the crops, other than cereals, are shown in the following table :—

Crop.	Estimated Total Produce.		Estimated Yield per Acre.		Average of the Ten Years 1896-1905.
	1906.	1905.	1906.	1905.	
Potatoes	Tons. 3,428,711	Tons. 3,762,706	Tons. 6'06	Tons. 6'18	Tons. 5'78
Turnips and Swedes	22,627,840	21,840,582	14'22	13'74	12'96
Mangold... ..	8,538,480	8,213,260	19'79	20'32	18'70
Hay from Clover &c.	3,200,969	3,143,443	Cwts. 29'21	Cwts. 28'72	Cwts. 29'06
Hay from Permanent Grass...	5,384,892	5,087,917	22'51	21'71	23'49
Hops	Cwts. 245,688	Cwts. 695,943	5'26	14'21	9'12

The two root crops have proved satisfactory in each of the three divisions. Turnips and swedes are half a ton per acre above last year, and $1\frac{1}{4}$ tons above the mean of the ten years, Wales and Scotland showing relatively slightly better results than England. Mangolds are rather more than a ton over the average in England, and as 97 per cent. of the crop is to be found there, the result for Great Britain as a whole is practically the same; it is of interest to note, however, that on the comparatively small area grown in Wales the yield was nearly 3 tons above the ten years' average, and represented the heaviest crop of mangolds raised in the Principality.

The hay figures present more than usual interest by reason of the marked contrast between England on the one hand, and Wales and Scotland on the other. In the case of hay from clover, &c., there is a deficiency in England of seven-eighths of a ton per acre as compared with the average. On the other hand, the crop in Scotland is $2\frac{1}{2}$ tons, and in Wales 3 tons, above the average, in both cases reaching a figure which has seldom been exceeded. The net result for Great Britain is practically a normal crop. The conditions are very similar as regards meadow hay; but in this case the deficiency in England is larger, amounting to $1\frac{1}{2}$ tons per acre. In Scotland the crop is $1\frac{1}{4}$ tons and in Wales $2\frac{3}{4}$ tons, above the average,

but as the quantity of hay mown in these two countries is relatively small, their influence on the general result is but slight, and a deficiency of 1 ton per acre is recorded for Great Britain as a whole. The returns for individual counties are not yet completed, but the conditions in the North of England approximate to the Scottish, while in the South the hay crops were generally deficient.

As already mentioned, the least satisfactory crop of the year is hops. In the twenty-two years during which these statistics have been collected, only once, viz., in 1888, has a lower yield per acre been obtained. As the hop area is now some 10,000 acres less than on that occasion, the present year's crop is the smallest returned; it is, indeed, little more than one-third of the quantity picked last year, which, however, represented the second largest crop on record.

In a general survey of the year's harvest, the most satisfactory features are the success of the corn and pulse crops in England and Wales, and the abundant yield of hay in Wales and Scotland. Wales, indeed, has been singularly fortunate, for the deficiency in potatoes is the only exception to an otherwise uniform record of unusually heavy crops. In Scotland only two of the ten crops were short, while in England three out of eleven (including hops) were deficient. The season as a whole may therefore be regarded as a very good one.

Russia is primarily an agricultural country, the bulk of the population being directly engaged in tilling the soil. In 1897, out of the whole population of 125,640,000 persons, no less than 70·3 per cent, or, 88,294,000 persons were returned as employed in agriculture, or dependent on those so employed. Many members of this agricultural class have other subsidiary occupations, but the figures serve to show the predominating importance of the industry. In the selection of crops, however, the peculiar climatic conditions impose restrictions, and favour the growth of rye, barley, and oats over large areas where the winters are

Wheat Cultivation in Russia.

too severe for wheat. Nevertheless, the enormous area which is more or less suitable for the latter crop has made Russia one of the chief sources of the world's wheat supply, and the conditions under which the crop is grown and the likelihood of an extension in the production, are factors of the greatest importance both to wheat-growing countries like the United States and to wheat-purchasing countries like the United Kingdom. An exhaustive inquiry into the information available on these points, which has recently been made by Mr. I. M. Rubinow for the United States Department of Agriculture, is valuable as suggesting the very great enlargement, which is possible under favourable conditions, of the wheat production of Russia.

Soil.—European Russia is divided into two distinct regions in regard to its soil, viz., the non-black and the black soil districts. The former includes the whole of the North and North-Western regions, while the latter is a large territory embracing the South and South-Eastern Governments, and characterized by the possession of a very fertile soil, black or dark in colour, varying in depth from a few inches to three to four feet. It is on this soil that the largest part of the crops of European Russia is grown, and with the exception of Poland, it takes in the whole wheat belt.

Area under Wheat and Rye.—The total quantity of arable land in European Russia has grown considerably during recent years, and the area planted to cereals, which represent the main crop, has also increased, and now amounts to 90 per cent. of the land in cultivation, or 58 per cent. of the arable, including that lying fallow. Rye, wheat, oats, and barley are the staple products, while millet and buckwheat are grown in large quantities. Reliable statistics are not available for long periods, because different areas have been included in different years, but an examination of the figures for the decade 1895–1904 shows on the one hand the predominance of rye, and on the other the steady gain of wheat. Though the area in rye has increased somewhat in that period, proportionately it has fallen considerably behind—from 38 per cent. of the cereal area in 1894 to 33·5 per cent. in 1904; while the area under wheat has increased from 22·6 per cent. to 26·8 per cent. of the cereal area, during the same decade, and all the other cereals, except buckwheat

and spelt, show a more or less regular increase. In these ten years the rye area has increased by 5·83 per cent., and the wheat area by 42·27 per cent. This remarkable growth is chiefly due to an extension of the area in European Russia, though increases have also taken place in Caucasia and Siberia. The areas under the two crops in 1896 and 1904 are shown in the following table:—

Region.	Wheat.				Rye.			
	1896.		1904.		1896.		1904.	
	Thou- sands of Acres.	Per cent.	Thou- sands of Acres.	Per cent.	Thou- sands of Acres.	Per cent.	Thou- sands of Acres.	Per cent.
European Russia : total	34,848	75·98	45,635	77·11	64,238	88·91	65,644	88·59
All black soil	31,141	67·89	41,149	69·53	27,006	37·37	27,987	37·77
Partly do.	2,861	6·24	3,585	6·06	15,309	21·19	15,409	20·79
Other soil ...	846	1·85	901	1·52	21,924	30·35	22,248	30·03
Poland ...	1,198	2·61	1,242	2·10	4,760	6·59	5,061	6·83
Caucasia ...	5,589	12·18	7,473	12·62	645	·89	621	·84
Siberia ...	2,905	6·33	3,352	5·66	2,509	3·47	2,696	3·64
Middle Asia	1,329	2·90	1,484	2·51	106	·14	72	·10
Total : Russia	45,869	100·00	59,186	100·00	72,259	100·00	74,093	100·00

While European Russia is the main source of both wheat and rye, Caucasia and Siberia claim relatively a much larger share of the wheat area, viz., 20·8 per cent. for wheat, as against 4·6 per cent. for rye. It is noteworthy that, although the culture of wheat has increased considerably in the Asiatic dominions, yet it has not grown faster than in European Russia. Wheat and rye, it will be seen, dominate distinct areas, though they meet on a common ground in the central provinces. The eighteen black-soil provinces produce more than two-thirds of the wheat, and only one-third of the rye. The nine provinces which are only partly black-soil contribute only about 6 per cent. of the wheat area, and almost 21 per cent. of the rye area. Finally, the twenty-six non-black-soil provinces play scarcely any part at all in wheat production, while their importance in the growth of rye is very great.

So far as European Russia is concerned, wheat culture outside the black-soil belt is insignificant. For this region the statistics

of acreage are available for twenty-two years, and show that the wheat area has extended from 28,944,000 acres in 1881, to 45,635,000 acres in 1904. The greatest increase has taken place in the south and south-east. In the three regions of New Russia, Middle Volga, and Lower Volga, 14,122,000 acres have been added, which equals 85 per cent. of the additional area devoted to wheat production in European Russia during the twenty-three years. The wheat area, nevertheless, has grown wherever climate and soil admit of wheat culture, and much more rapidly than the rye area. To a large extent the increase is explained by the additions, amounting to 22,800,000 acres, to the arable land in European Russia, the gains having been largest in the newer regions, such as New Russia and the Eastern Governments.

Production.—This extension in area has also been accompanied by an increase in production, but notwithstanding the exceptional fertility of the black-soil region, the average yield remains at probably a lower level than in any other country. Taking winter and spring wheat together, the average is about $9\frac{1}{2}$ bushels per acre. To some extent this low figure is due to the large proportion of spring wheat, which gives a lower yield than the winter variety, largely owing to the fact that hardly any manure is used in the cultivation of spring wheat.

On the whole, the statistical evidence shows (1) that wheat growing has been much more rapidly increasing than that of other cereals, (2) that rye growing has been almost stationary and has declined in some localities, (3) that the wheat area shows a strong tendency to move southward and still more eastward, and (4) that the average yield of wheat in Russia is considerably lower than in any other wheat-growing country. The marked oscillations in the average yield, characteristic of countries with deficient agricultural methods, are especially noticeable in Russia. An explanation of these characteristic phenomena must be sought for in the peculiar conditions of Russian agriculture, which are primarily dependent on the system of land tenure.

Land Tenure.—A detailed account of the ownership of land in Russia is given in the Bulletin above mentioned. Briefly, it may be said that in 1861, at the time of the emancipation of the

serfs, 257,000,000 acres of land were allotted to 7,942,000 peasant families, giving an average of $32\frac{1}{2}$ acres per family. The bulk of this land was allotted not to individual families, but to the commune, and is held in common ownership by the villages. This land is redistributed at certain intervals between the members of the community for individual cultivation. The method of division naturally presents great difficulties, but as the predominating system of agriculture in Russia is the three-field system described below, the land in each commune is divided into three parts, and each part is divided into parcels according to the fertility; these are then divided into rectangular strips theoretically of equal value. It will be seen that the system is analogous to the open-field system of the English manor, and it presents similar obstacles to agricultural progress. The possibility of redistribution tends to discourage manuring and high cultivation, while the separation of the strips makes their working laborious and difficult. There seems, however, to be a tendency to abandon the redivision of communal lands, and for the richer peasants to rent and cultivate the allotments of their poorer brethren.

Practically all the land which was not allotted to the peasants was at the time of the emancipation the property of the State and of the nobility, but much of this land has since been sold to the peasants and to merchants and others of the commercial class.

Broadly, then, land in Russia may be said to be in communal or in private ownership, and agriculture on the privately-owned land is naturally of a more advanced character, and invariably gives a higher yield. Commercial farming, especially farming on a large scale, has made considerable progress, and wheat culture on private lands has very rapidly increased. This fact is of importance, because even a slight increase in the yield would increase the production of wheat in Russia much more than a further extension of area. The relative importance of the two systems may be gathered from the fact that 17,627,000 acres of the wheat acreage is in private hands, and 26,126,000 acres in communal ownership. Taking the entire Russian Empire, the excess of the spring-wheat yield on private lands over that on the peasants' lands is more than 1 bushel per

acre, which, with an entire average yield of 8 to 9 bushels, is not a small difference. The winter yield shows a difference of 3 bushels, which is an evident result of the fact that the private estate owners manure their winter fields, while the peasants often do not. The bulk of the area is, however, in spring wheat, and in some of the provinces the average yield on the peasant land is extraordinarily low; for instance in the Middle and Lower Volga regions the average for nine years was scarcely higher than $6\frac{1}{2}$ bushels, and this notwithstanding three very good crops in the period; twice it fell below 5 bushels. Even in New Russia, where the great extension of area has taken place, the yield which the peasants secured four years out of the nine was between 5 and 9 bushels.

While the influence of climatic conditions cannot be altogether denied, yet it is generally acknowledged that, aside from occasional total failures of crops, the low average yield is caused by the primitive Russian agricultural methods. Improvements in this direction would therefore be likely to produce a marked development in the yield.

Rotation of Crops.—The three-field system is the most prevalent system of agriculture in Russia, and almost universally so in the centre of the wheat-belt. Under it, the land is planted with a winter crop, generally rye, one year, a spring crop during the next year, and lies fallow during the third. Improved systems of crop rotations and new crops have been introduced on the large estates, but on the communal lands individual members are obliged to conform to the system of agriculture followed by the entire community. This is one of the main reasons why the transition to better systems of agriculture has been practically limited to those parts where household or private ownership is met with. Thus peasant agriculture is most advanced in Poltava, where household ownership is much more widespread than the commune.

Machinery.—Insufficiency of proper agricultural machinery is one of the most observable features of Russian agriculture. Even the modern plough is still a luxury in many parts, while drills, harvesters, threshers, &c., are comparatively but little known. The imports and the manufacture of implements of all

kinds have, however, increased very rapidly of late years, and the most improved and modern agricultural machinery is to be found on some private estates, and in the south-western provinces smaller implements are in universal use even by the small landholders and peasants. Great efforts in this direction are made by the Zemstvos, who have in many districts established stores for the sale of machinery to the peasants.

Manuring.—Another great cause of the low yields is the insufficient manuring, as the three-field system to a great extent substitutes fallowing for manuring. In the non-black-soil region the entire winter field is manured, but in the black-soil districts the practice is much less common. Lack of agricultural knowledge and lack of manure owing to insufficient cattle are perhaps the principal causes, while the communal ownership also tends to discourage the practice. On the whole, the causes of the backwardness of Russian agriculture are to be found on the one hand in the system of land tenure, and on the other in the antiquated methods of agriculture due to the poverty and ignorance of the people.

Cost of Production.—Labour and rent have a very great influence on the cost of production, and it is stated that the cost of wheat growing in Russia, while extremely variable, is, on the whole, far from being as low as would be thought, judging from the extremely low wages, and that the low average yield and high rents are the essential causes of the comparatively high average cost of production, which oscillates between 1s. 5½d. and 1s. 10½d. per bushel, exclusive of rent.

In addition to European Russia, two of the less known portions of the Russian Empire offer immense possibilities in the direction of wheat cultivation, and in both this crop is at the present time the main object of cultivation.

Caucasia.—Neither the total production nor the total acreage of the whole of Caucasia can be given, but a normal crop of wheat in Transcaucasia is officially estimated at 81 million bushels and the production in Northern Caucasia in 1904 was practically the same. The acreage in both countries is believed to be rapidly extending, but the population is very scanty. The yield is higher than in European Russia, and an increased population,

and improved agriculture, especially better implements and machines, are likely in the future to give Caucasia a prominent place among the wheat-growing countries of the world.

Siberia.—A very small part of the available territory in Siberia has been settled as yet, the total area under cultivation being about $10\frac{3}{4}$ millions of acres. Wheat is the most important crop, but many conditions are necessary for its rapid development, such as a growth in the population, assisted by immigration from European Russia, improved agriculture, &c. The commercial demand will ensure this to some extent, but it partly depends upon Governmental measures and social efforts for the enlightenment of the Siberian population.

For some years past experiments have been conducted in different parts of the country with the view of testing the effect of different manures on poor pastures.

Improvement of Poor Pasture.

They had their origin in the so-called "Manuring for Mutton" experiments, initiated by Dr. Somerville at the Northumberland Agricultural Experiment Station at Cockle Park, and were designed to test the question whether the application of artificial manures would not at a less cost so improve the herbage that sheep would lay on more mutton than similar animals grazing similar, but unmanured, land, though the latter animals were fed with cake. These experiments have now been proceeding at Cockle Park for nine years (1897–1905) and in a Report just issued Professor Gilchrist summarizes the results obtained over the whole period.

The field extends to 34 acres, and is divided into 11 plots, each $3\frac{1}{20}$ acres in extent; each plot is stocked annually with a suitable number of sheep, varying with the quality of the pasturage, and the benefit derived from the manuring is measured by the progress made by the sheep. The manures applied and the average results are given in the following table:—

MANURES FOR PASTURE IN TREE FIELD.

Results per acre for nine seasons, 1897-1905. Plots $3\frac{1}{8}$ acres in area.

Plot.	Treatment and its total cost for nine years, 1897-1905.		Average of nine years, 1897-1905.			
	Treatment.	Cost.	Hay.	Live weight increase per sheep over plot 6.		Annual gain or loss (—).
				Amount.	Value at $3\frac{3}{4}$ d. a lb.	
		s. d.	cwt.	lb.	s. d.	s. d.
1	Dec. cotton cake fed on plot, total of 597 lb. 1897-8, again 1903, and again 1904* ...	116 0	19½	69½	21 9	8 11
2	Common lime, 4 tons 1897, and again 1903 ...	100 0	12½	12½	3 11	-7 3
3	Basic slag, 10 cwt. 1897 ...	23 6	25	79½	24 11	22 3
4	Basic slag, 5 cwt. 1897, and again 1900 ...	23 6	20½	66	20 8	18 0
5	Superphosphate, 28 per cent., 7 cwt. (100 lb. phos. acid) 1897, and again 1900 ...	36 0	16½	57	17 9	13 9
6	Untreated throughout ...	—	8½	—	—	—
7	Super. as on plot 5; and sulph. potash, 100 lb. 1897, again 1899, and again 1903 ...	62 0	17½	65½	20 7	13 8
8	Super. as on plot 5; and ground lime, 10 cwt. 1897, again 1899, and again 1903 ...	70 0	20½	79½	24 9	17 0
9	Super. as on plot 5; and sulph. am., 84 lb. (17 lb. N.) 1897, again 1899, again 1900, and again 1903 ...	75 0	20	54	16 11	8 7
10	Diss. bones, 6 cwt. (100 lb. phos. ac. and 17 lb. N.) 1897, and again 1900† ...	66 0	20	61½	19 3	11 11

The Untreated Plot.—For the last five years this plot (plot 6) has been stocked with four sheep, but it had a larger number in the first year. The average gain in live-weight per acre per annum has been $37\frac{1}{4}$ lb., which at $3\frac{3}{4}$ d. a lb. is equal to 11s. 7d. an acre. Live-weight increase, however, is not worth nearly as

* Each lot of cake contained 42 lb. nitrogen and (assumed) 18 lb. phos. acid and lb. potash.

† Plot 10 has received half the total amount of nitrogen applied to plot 9

5 cwt. slag contain 100 lb. phosphoric acid. 100 lb. sulphate of potash contain 50 lb. potash. Dissolved bones, 1906, contain 100 lb. phosphoric acid and 22·8 lb. nitrogen. 142 lb. nitrate of soda contain 22·8 lb. nitrogen

The cost of manures per ton was as follows:—Basic slag, £2 7s.; superphosphate, £2 12s.; sulphate of potash, £9 14s.; sulphate of ammonia, £13; dissolved bones, £5 10s. Decorticated cotton cake cost £6 12s.; common lime, 12s. 6d.; and ground lime £1 per ton.

much from this plot as from the plots which have been improved by treatment, so that the real returns are considerably less than the above. In five of the nine years the sheep on this plot were worth less at the end than at the beginning of the season.

Results from Basic Slag.—On plot 3, 10 cwt. slag applied for 1897 has at a cost of 23s. 6d. given an average annual gain of 22s. 3d. for the nine years, a marvellous return from this single dressing. It had the greatest effect in the third season after its application (when it gave 163 lb. per acre of live-weight increase, worth about 51s.), and even in the ninth season afterwards has given 33 lb. of live-weight increase, worth about 10s. 2d. an acre. Clover development was greatest in the second year (about 20 per cent. of the herbage). The poor bent grass has been greatly reduced. The soil has been improved in texture and darkened in colour to a marvellous extent on this plot, and on all the plots where clover development has taken place.

On plot 4, 10 cwt. slag, half applied for 1897 and half for 1900, has not been quite so effective, the average annual net gain for the nine years being reduced to 18s. It is evident that the application of a heavy dressing of slag is likely to give the best result in commencing the improvement of poor pasture of this character. Ten cwt. slag gave 321 lb. live-weight increase per acre in the first three years after its application, whereas 5 cwt. slag gave only 132 lb. in the same time, considerably less than half of the larger dressing. That a second application of slag may be most effective is shewn by the fact that for three years after the first application of 5 cwt. slag the live-weight increase amounted to 132 lb., while the same for three years after the second application amounted to 284 lb. The second application, therefore, more than doubled the results. In the ninth season plot 4 has given an increase of 41 lb. in live-weight per acre, as compared with 33 lb. on plot 3, which shows that although the net gain has been greater after the single dressing of slag, the unexhausted residue is now greater where half of it was withheld till three years later. Five cwt. slag increased *the proportion* (not total amount) of clovers to the same extent in the first three years as did 10 cwt., while in the first year after the second application of 5 cwt. slag, the clovers amount to 32 per cent., and even in the ninth year (or sixth

after the second application of slag) to 17 per cent. While, therefore, the results on this plot have not been quite so good as on plot 3 the clover development has been greater and much better maintained.

The following figures show the comparative effects of 15 cwt. slag on plot 11 (not shown in the table), and 10 cwt. slag on plot 3 for six years after application, the former having been applied in 1900, and the latter in 1897 :—

					Live-weight increases in lb. per acre.	
					15 cwt. slag.	10 cwt. slag.
First year ...	...	...	...	...	45	40
Second year ...	...	...	...	...	100	118
Third year ...	...	...	...	...	144	163
Fourth year ...	...	...	...	...	70	87
Fifth year ...	...	...	...	...	73	82
Sixth year ...	...	...	...	...	44	86
Total ...	...	...	...	...	484	576
Average ...	...	...	...	...	80	96

. The better results given by 10 cwt. slag may be partly accounted for by the fact that while 10 cwt. slag developed 20 per cent. of clover two years after its application, 15 cwt. increased it to over 35 per cent., but Yorkshire fog was developed to the extent of nearly 50 per cent. four years after the heavier dressing of slag, whereas it increased in the same time to less than 20 per cent. by the lighter dressing. This large amount of fog is the probable cause of the smaller returns from the heavier dressing of slag in the later years.

Results from Superphosphate.—Plot 5 had 7 cwt. superphosphate per acre applied for 1897 and the same for 1900. This contained the same amount of phosphoric acid and was applied at the same times as the two dressings of slag on plot 4. In the first three years superphosphate gave a total live-weight increase of 125 lb. as compared with 132 lb. from slag similarly applied on plot 4. Superphosphate gave the better result in the first year but a poorer one in the last two years. The second application of superphosphate gave 271 lb. increase in live-weight in the three years after the second dressing had been applied as compared with 284 lb. by slag in that period. That this manure becomes more quickly exhausted than slag is shewn

by its giving only 22 lb. live-weight increase per acre in the ninth season (sixth after the second application), whereas slag gave 41 lb. in the same year. The net gain from this plot was 13s. 9d. per acre annually as compared with 18s. from slag similarly applied. With one year's exception (1900) clover has not been so well developed on this plot, but at the same time the clover increase had been of a satisfactory character, and has been well maintained till the ninth year.

Results from Dissolved Bones.—Plot 10 had 6 cwt. dissolved bones in 1897 and the same in 1900. These contained the same amount of phosphoric acid as the superphosphate for plot 5, and in addition the former contained 34 lb. nitrogen in the two dressings. The sheep have increased in live-weight $4\frac{1}{2}$ lb. more per acre annually on this plot than where superphosphate was used, but owing to the lower cost of the latter manure the net gain per acre annually on this plot is only 11s. 11d. an acre as compared with 13s. 9d. from superphosphate. The results also show that the lasting effect of dissolved bones corresponds very closely to that of superphosphate. Both these manures give their best effects more quickly than slag, but do not give such good results in the later years. Dissolved bones have not retained clovers so well in the later years as superphosphate.

Results from a Potash Manure.—Plot 7 has had the same superphosphate as plot 5, and in addition 100 lb. sulphate of potash for each of the years 1897, 1899 and 1903. The result has been an average increase per acre annually of nearly 9 lb. live-weight over plot 5, which has just paid the cost of the potash manure, but has given no increase in the net gain. It is rather striking that the potash manure has not at all increased the clover plants, as there have been fewer of these here than on plot 5, where superphosphate only was used. There is evidently nearly sufficient potash in this clay soil to supply the pasture requirements, at any rate, for a considerable time.

Results from Sulphate of Ammonia.—Plot 9 received the same superphosphate as plot 5, and in addition $\frac{3}{4}$ cwt. sulphate of ammonia for each of the years 1897, 1899, 1900 and 1903. As a result the average annual increase in live-weight has been reduced by 3 lb. an acre, and the net gain per annum from 13s. 9d. to 8s. 7d. an acre. In the four years that sulphate of

ammonia was applied the live-weight increase was greater by 7 lb. per acre per annum, but in the five years this manure was not used the average decrease was $13\frac{3}{4}$ lb. (= 10s. 1d.) per acre per annum! Here we have a clear demonstration of bad after-effects of this manure on pasture, and a striking evidence against this manure having any residual value after the first year it is applied to pasture, showing on the contrary that compensation is needed for its bad after-effects. This manure has on the average slightly repressed the clover.

Results from Lime only.—Plot 2 had 4 tons lime per acre in 1897, and another 4 tons in 1903. The increase in live-weight of the sheep has been only $12\frac{1}{2}$ lb. per acre annually, and when the cost of the lime is deducted, the net loss has been 7s. 3d. per acre per annum. On this poor exhausted soil (especially poor in available phosphates) there has not been sufficient plant food on which the lime could exert its beneficial action. Nor has the lime sweetened the coarse natural herbage to any extent, as sedges, mosses, &c., are still nearly as abundant here as on the untreated plot, while clover development has been very slight.

Results from Lime and Superphosphate.—Plot 8 has had the same superphosphate as plot 5, and in addition 10 cwt. ground lime in each of the years 1897, 1899 and 1903. This addition of lime has increased the live-weight of the sheep per acre per annum by $22\frac{1}{4}$ lb., and the average annual net gain from 13s. 9d. to 17s. per acre. The live-weight increases due to the addition of lime have been about the same for the first, second and third years after each application. The average annual increase in live-weight from this plot is practically the same (about 79 lb.) as that from 10 cwt. slag all applied in 1897 (plot 3), these being the two plots that have given considerably the highest increases. The greater cost of the superphosphate and lime than of the slag accounts for the considerably less net gain from the former. The results on plots 3 and 8 show that a combination of superphosphate and lime has given very similar results to slag, and show that the lime present in slag is a most valuable ingredient in it, as well as the phosphoric acid which it contains. Lime and superphosphate have developed clovers on this plot to practically the same extent as slag on plot 4, and considerably more than superphosphate on plot 5.

Results from Feeding Decorticated Cotton Cake to Sheep.— On plot 1 about 600 lb. per acre of decorticated cotton cake has been fed to the sheep in the two years 1897-8, while 600 lb. were also fed to them in each of the years 1903 and 1904. The result has been an increase of $69\frac{1}{2}$ lb. in live-weight per acre annually and a net gain of 8s. 11d. per acre per annum. Taking the two years 1897-8 as one for this purpose the cake in the years in which it was fed gave an average increase of 146 lb. in live-weight per acre per annum, which is equal to 45s. 7d. at $3\frac{3}{4}$ d. a lb. As each 600 lb. of cake cost about 38s. 8d. this left a gain of 6s. 11d. an acre from feeding the cake in each of these years. In the five years that cake was not fed on this plot, the average live-weight increase per acre was about $37\frac{1}{2}$ lb., equal to about 11s. 8d. in value, a most satisfactory result. There is no doubt that the extra treading of the pasture by the heavier stock in the years that the cake was fed has assisted the manurial ingredients of the cake passed through the sheep to the land, in improving the pasture. The good effects of the cake fed in 1897-8 were well maintained for four years thereafter, as even in the fourth season after the cake was stopped there were 30 lb. per acre of live-weight increase, worth just over 8s. The results in 1905, however, were not up to expectation, as only 36 lb. increase in live-weight were given, although cake had been fed for the two previous years.

Returns in Proportion to Cost of Treatment.— For every shilling spent on treatment, the following returns have been given:—By slag on plot 3, 9s. 6d.; by same on plot 4, 7s. 11d. by superphosphate on plot 5, 4s. 5d.; by same and potash on plot 7, 3s.; by same and ground lime on plot 8, 3s. 2d.; by same and sulphate of ammonia on plot 9, 2s.; by dissolved bones on plot 10, 2s. 7d.; by lime on plot 2, 8d. (loss); and by cake fed on plot 1, 1s. 8d.

The Report also gives full details as to the effect of the manures on the botanical composition of the herbage on the various plots.

There are several other experiments of an allied nature in progress at Cockle Park. In one of them, larger plots in Hanging Leaves Fields, have been stocked with both cattle and sheep, so as to give the pasture a better chance of improving

than when stocked with sheep only, and another (Palace Leas Field) is designed to test the effect of manures on the quantity and quality of meadow hay.

The general results of all these trials are summed up by Professor Gilchrist, as follows :—

1. For improving the extensive areas of poor Boulder Clay pasture in Northumberland, the best start can be made with a dressing of 10 cwt. an acre of basic slag. A judicious combination of superphosphate and lime will probably have the same effect, but at a considerably greater cost. Other phosphatic manures than slag are all useful for this purpose, but are not so profitable. It is probable that this initial treatment may be advantageously followed by dressings of 5 cwt. slag per acre about every three years, and the judicious feeding of cake to the grazing stock.

2. For poor old pasture on sandy soils slag may also be exceedingly effective, if a potash manure is also used.

3. The feeding of cake on poor pasture will probably prove a most effectual assistant to slag in effecting improvement. The larger amount of stock carried when cake is fed entails closer grazing and aids greatly in the development of sweet bottom herbage. When a pasture has become rather coarse the removal of the rough herbage by mowing at the end of the season is most desirable.

4. Liming of pasture is an expensive operation, and the returns may be most disappointing. It is only under special circumstances that it is likely to be profitable.

5. Judicious applications of slag and dung have proved a remarkably good combination at Cockle Park for developing sweet clovery herbage on thin hay and pasture land. When dung is used a potash manure is not needed even on a sandy soil, and a nitrogenous manure should not be used. The results on plot 1 of Palace Leas show the disastrous effects of using complete artificials in combination with dung.

The following note has been communicated to the Board by Mr. J. O. Peet, Lecturer to the Herefordshire County Council :—

Red Clover*
(*Trifolium pratense*). Red clover is largely used in alternate husbandry ; in the south of England it is chiefly grown as a pure crop, while in the north and moister districts of the country it is largely sown with Italian rye grass for a one year's ley, or with a mixture of grasses for a two or three years' ley. When used alone, about 16 lb. of seed are usually sown, and in mixtures various proportions are employed, the smaller quantities being used for leys of longer duration. It grows freely upon practically all soils except those which are either very wet or very dry, but thrives better and for longer periods upon rich, deep, heavy loams, particularly when these contain a fair supply of lime. It yields the heaviest crop during the first year, but on suitable soils continues to grow a second or even a third year. Remunerative crops cannot be grown frequently upon the same land ; usually four years, and often a much longer period, must elapse after a red clover crop, whether grown as a pure crop or in a mixture, before the soil is capable of again yielding a good crop of it. Land which is thus unable to produce clover is said to be clover-sick. On such land a good plant of clover may often be obtained, but during the period from October to March most of the plants disappear. This is probably not always due to the same direct cause ; it may occasionally be due to infection of the ground with the fungus *Sclerotinia trifoliorum*.

Argentina.—The Board have received through the Foreign Office a despatch from the British Consul at Rosario, dated

**Notes on
Crop Prospects
Abroad.**

November 6th, stating that the wheat and linseed crops in some parts of the Consular district have suffered from unfavourable weather and from locusts. It is at the present time impossible to obtain reliable information of the quantity of grain there will be for export, but it is now known

* See "Red Clover Seed and its Impurities," *Journal*, Vol. XII., No. 12, March, 1906.

that although a larger area was sown than last year, the quantity for export will be less. Locusts are reported from several districts, and it is feared that they may do considerable damage to the maize crop.

Russia.—The Board are informed through the Foreign Office that the official *Commercial and Industrial Gazette* of St. Petersburg, of November 20th, gives the Central Statistical Committee's preliminary data as to the totals of the Russian winter grain crops of the current year. In sixty-three Governments of European Russia, the winter rye crop is estimated to amount to 315,860,000 cwt., while the winter wheat crop is expected to reach 127,131,000 cwt. The sixty-three Governments include the fifty Governments of European Russia proper, the ten Governments of Poland, and three Governments of Caucasia.

The sheep kept in the Shetland Islands include, in addition to the native breed, the Cheviot, Black-face and Leicester, and crosses between Shetland ewes and these breeds.

Sheep in the Shetland Islands.

The pure Shetland is a small sheep having an average weight when fat of about 30 lb.; it has a handsome head, prominent eyes, a thick, short body, supported by clean, deer-like legs; the tail is short, about four inches in length and pointed. Being very hardy, this sheep can gather a living where the larger breeds cannot subsist. The colour varies very greatly from white to black, including brown, grey and flecked, that is, black or dark with white spots, and the shades known locally as murrat and sheila.

The ewes are generally hornless, but the rams are often horned. As mothers the ewes are particularly careful of their lambs, and have usually an abundant supply of milk.

The fine wool of the Shetland sheep is a very valuable asset to the owner, being always in demand at home for hand manufacture, and also for export to Scotland. The average weight of a fleece is about 2 lb., it is not clipped but pulled off by hand, and when taken at the proper time it peels off easily.

This breed is used with great success for crossing purposes, especially if a better pasture be provided, and their deep-milk-

ing properties make them very valuable as mothers. The produce is usually exported to Scotland as lambs. Cheviot, Black-face and Leicester rams are used for crossing.

Cheviot and Black-face one-year-old ewes are also imported from Scotland for crossing with the Leicester tup for half-bred lambs. One or two small flocks are kept for breeding pure Cheviots. The lambs are sent to Aberdeen market every year in the month of September.

The Black-face breed is much hardier than the Cheviot, though not so strong as the Shetland or native sheep. They chiefly feed on the hills and generally give plenty of milk to their lambs in the spring. The Cheviots graze on the low-lying arms.

Russia.—The Board are informed through the Foreign Office that cattle entering Russia by road, rail, or water must be accompanied with certificates from the proper authorities of their country of origin testifying to the freedom from disease of the place whence they come. These certificates must bear the *visa* of the Russian Consul.

Live Stock Import Regulations.

Such cattle are further subject to veterinary examination at frontier stations and at ports of disembarkation.

There are no special regulations governing the admission into Russia of breeding cattle.

Hungary.—In reference to the note in the *Journal* for November (p. 490), the Board are now informed through the Foreign Office that permission for the introduction and transit of breeding stock—cattle, sheep, goats and pigs—from Great Britain into or through Hungary must be obtained in each individual case from the Royal Hungarian Ministry of Agriculture, and the conditions to be observed will be laid down in each such case.

The following note on Turkey Raising has been communicated to the Board by Mr. Edward Brown, F.L.S. :—

For some years the supply of home
Turkey Raising. turkeys has been much below the demand, and prices for good quality birds at the Christmas season have been very high. Upon good dry soils,

with rich herbage and a fair amount of shelter, more especially where the farms are not too small, there is no branch of poultry-breeding which offers better returns, if the birds can be properly looked after. On cold, damp land they are better left alone. Skim-milk is a most important part of the food during the final stage of fattening, and the best specimens are generally produced where that is available. Money is not so rapidly realised as with either chickens or eggs, but is received in substantial amounts. One point in favour of turkey-raising is that there is no need to force laying and hatching in the spring, consequently the young stock appear when natural food is becoming abundant, and they do not, therefore, demand the same care as winter chickens. From March to May is quite early enough to bring out the youngsters. Upon chalk and limestone lands, more especially if the elevation is considerable, in a dry, hot summer, there is frequently very little feed, and young turkeys fail to make the growth desired. Hence these districts are less suited for turkey-raising than where the top soil is thicker and less liable to drought.

The Board of Agriculture and Fisheries have received information that the American gooseberry mildew (*Sphaerotheca mors-uvæ*) has been discovered in more than

**American Goose-
berry Mildew.**

one place in England, and as there is reason to believe that the disease, in at least one case, is of some years standing, they think it desirable to warn all fruit-growers, nurserymen, gardeners and other growers of gooseberries, of the dangers involved. The disease, which is termed American, owing to the extensive damage it has done in America, is of a very serious character, and has rendered the culture of gooseberries unprofitable and even impossible wherever it has appeared.

The mildew generally becomes visible during the last half of May or the first half of June, when it appears in the form of "glistening frost-like spots" on the fruit on the lower part of the bush, where there is usually dense shade. It then spreads to the leaves and tender shoots. In its earlier stages it has

a cobwebby appearance, which soon becomes white and powdery from the development of the light conidial spores. Later in the season the leaves and other parts affected turn a rusty brown. The fungus prevents the berry from growing, and the fruit becomes worthless. During the summer therefore the disease can easily be detected and the bushes can be dealt with according to the extent of the disease.

During the winter the disease remains dormant and will not spread from plant to plant. During this period, however, it can be conveyed from one district to another in bushes and stocks. It is clear that enormous and irreparable mischief may be done in this way, and it is the duty of all nurserymen to take precautions not only for their own sake but for the sake of the locality in which they live.

The Board therefore urge all nurserymen and market gardeners who intend to buy bushes or stocks of *Ribes aureum*, whether from abroad or from Ireland or even from other growers in Great Britain to observe the following precautions:—

(1). Only to purchase from those growers or dealers who are prepared to offer a guarantee that the plants they are selling are of their own growing, and that no case of American gooseberry mildew has ever appeared in their gardens or in the immediate neighbourhood, and that the said plants have not been near any gooseberry plants recently brought on to the seller's premises.

(2). To plant such gooseberry bushes or stocks as they may buy, or acquire from other premises than their own, in a special part of their nursery or garden at some distance from other gooseberry bushes.

(3). To destroy all plants found to be affected with the mildew, and to spray with Bordeaux mixture all others suspected of being infested, with the object of destroying any external *mycelium* or adhering spores that may be present. This should be carried out when the disease is dormant.

(4). To keep a careful watch on all gooseberry plants in the forthcoming spring for any signs of mildew, and to report any appearance suggestive of the disease immediately it is detected to the Secretary of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.

The Board would be glad if growers would assist them in discovering any unreported cases of the infestation.

There is at present no law dealing with the eradication of the pests of fruit trees in this country, but the Board believe that the American gooseberry mildew has not spread very far as yet, and that it depends very largely on the action of the fruit growers, nurserymen, and market gardeners whether its further development can be prevented.

In Vol. XII., p. 305 of this *Journal* an account was given of certain experiments conducted in the Jodrell Laboratory, Kew, with the object of ascertaining the relative value of various substances in preventing the rapid decay of ripe fruit. These experiments were based on the fact that

**A Method of
Preventing the
Rapid Decay of
Ripe Fruit.**

the primary cause of decay and rotting of ripe fruit is in most cases the presence of the germs of fungi, yeasts, bacteria, &c., on the surface of the fruit, and not—within a definite limit of time—to any inherent tendency on the part of the fruit to decay. Among the various substances experimented with, commercial formalin (=formaldehyde, 40 per cent.) proved to be most suitable, on account of its efficiency, cheapness, and ease of application, and because of the entire absence of danger in its use. The method of treatment explained in the article quoted above is here reproduced.

“In the case of fruits where every part is eaten, as strawberries, &c., the fruit should be immersed for ten minutes in cold water containing 3 per cent. of commercial formalin. On removal immerse the fruit for five minutes in cold water, and afterwards place it on wire-netting or some similarly open material to drain and dry.

“When the fruit has a rind or ‘skin’ that is not eaten, the immersion in water after the treatment in formalin solution can be omitted with advantage.”

During the present season a second series of experiments have been conducted at Kew, for the purpose of checking the results previously obtained, and of experimenting with other kinds of ripe fruit.

No special selection was exercised in procuring the fruit for experiment. The plums, cherries, grapes and pears were purchased at a local fruit shop, and the gooseberries and bananas were obtained from a street vendor. In each case a certain portion of the fruit was treated with formalin ; this was placed alongside an untreated portion on a plate of glass ; the two were covered with a bell-jar, and exposed to the ordinary temperature of the laboratory.

The following table shows the number of days that treated fruit remained perfectly sound and free from mildew, after the untreated check fruit had become covered with mould and quite unfit for use :—

Plums	{ Damson	...	...	...	...	9 days.
	{ Victoria	...	...	...	...	5 "
Bananas		...	...	...	...	10 "
Currants	{ Black	...	...	...	...	5 "
	{ Red	...	...	...	...	4 "

The following table shows the kinds of fruit used last year for testing the preservative properties of formalin, and indicates the number of days during which treated fruit remained perfectly sound, after the check or untreated fruit had become unfit for use. The first column of figures refers to last year's experiments, the second column to this year's corroborative experiments :—

Cherries	...	...	7 days	...	...	8 days.
Gooseberries	...	...	7 "	...	...	6 "
Grapes...	...	...	4 "	...	...	6 "
Pears	...	...	10 "	...	...	9 "
Strawberries	...	...	4 "	...	...	5 "

It is important to remember that all the kinds of fruit experimented upon were quite ripe and had been exposed for sale, and were consequently exposed to infection, and that in some instances they were more or less bruised. With fruit carefully gathered and treated at once, the duration in a saleable condition might be anticipated to extend over a longer period than is indicated by these tables.

In the case of apples that are just pitted with disease, treatment with formalin proves of service. Apple rot, caused by the fungus called *Glæosporium fructigenum*, Berk., is very destructive to ripe fruit, on which it first appears as minute scattered spots on the skin ; these spots rapidly extend and form large, brown sunken patches ; within a very short time this fungus reduces the fruit to a brown, rotten mass. A dozen apples

showing the first stage of this disease were immersed for a quarter of an hour in a solution of formalin of the strength given above, and afterwards dried. This was done during the last week in August ; the spread of the diseased spots was completely arrested, and the apples are still—end of November—in good condition. A dozen similarly-affected apples, collected at the same time but not treated with formalin, were completely rotten by the end of September.

By employing the method of treatment described, pitted or slightly diseased apples can be kept in a condition fit for use for several weeks longer than when no treatment is applied. This is a point of some importance both to grower and fruit dealer. In the case of cottagers and others who store a certain quantity of apples for winter use, it would well repay the very small cost and trouble incurred to treat all apples previous to storing. The method is simple ; put ten gallons of water (preferably rain water) into a cask or a zinc bath ; add three pints of formalin : mix thoroughly ; then immerse as many apples, contained in a net or loosely-woven sack, as the water will cover. The fruit, after remaining in the solution for ten minutes, the sack being partly lifted up two or three times to ensure every part of its contents coming into contact with the liquid, should be removed from the sack and placed on a layer of straw, hay, or some suitable substance to drain and dry. It is not necessary to immerse in water, after their removal from the formalin mixture, apples that are intended for storing. Plums, strawberries, and other soft fruits should be placed in a sieve or some such firm, open structure for immersion in the solution.

The strength of the formalin solution does not deteriorate by use, so that the process of sterilizing batch after batch of fruit can be continued until the solution is practically used up in the process.

However valuable the method of fruit preservation described here may be in extending the duration of ripe fruit in good condition at home, the greatest benefit, as stated in a previous report on the subject, will be in connection with imported fruit. Many kinds of tropical fruit that, owing to their rapid deterioration and decay, never reach our shores, could be introduced if treated in this manner before shipment. The fact that many

tropical fruits decay very quickly in their native country is in reality no argument against the suggestion. It only indicates that in their native countries, as in this and every other land, the surface of every ripe fruit is loaded with the spores of fungi wild yeasts, &c., which attack the tissues and set up a fermentation that is often mistaken for the normal decay due to over-ripeness. As an example, the state of semi-decay in which bunches of bananas so frequently reach us is in most instances entirely due to the attacks of various superficial organisms capable of inducing fermentation. This could be prevented by the adoption at the port of shipment of the treatment recommended above.

The Board have received from the Foreign Office a dispatch by Mr. Cooke, British Commercial Agent in Russia, in which it is mentioned that, according to a statement in the *Official Commercial and Industrial Gazette* (November 3rd), the Agricultural Department proposes to purchase abroad considerable lots of agricultural machinery to the amount of about a million roubles for the Government depôts in Siberia. The foreign machinery supplied, both by the Government and the private depôts, established at all the chief centres in western and central Siberia, is almost exclusively American. The exhaustion of stocks during the war, the further interruptions of goods traffic due to return military traffic, and the demand created this year by a plentiful harvest in Siberia, have doubtless necessitated a replenishment of both Government and private supplies.

**Purchase
of Agricultural
Machinery for
Siberia.**

The central offices of the Siberian agricultural machinery stores are at Omsk, but American manufacturers have their agents in every town and in most of the central villages. The machines most largely imported are mowers and rakes, reapers and to a smaller extent binders. These are nearly all American. The only British competition, and that hitherto but very slight, is from Canada, and the Canadian machines go by the general name of American. Mr. Cooke thinks that this Canadian competition might be developed. British competition in Russia tends rather to threshers and portable

engines, but is little if at all developed in Siberia, the threshers there, worked by horse-power, being mostly of simple construction or of Russian make. More might be done in Siberia in British sickles, a Sheffield make being well known, but not having the sale of Austrian and Russian makes. Scythes are mostly Austrian. Ploughs in Siberia are usually of very primitive Siberian or Russian make, but more advanced makes of South Russian and German origin have a considerable sale. British ploughs seem unknown.

The Government depôts, of which there are about thirty, scattered over the agricultural districts of Siberia, selling Russian and American machines, favour the particular makes most in demand in the different districts. They deal direct with the American manufacturers or through regular American agencies established in Siberia. The head office of the Government depôt is at Omsk.

Mr. Cooke furnishes a list of the chief private firms and Government depôts in Siberia selling agricultural machinery, and this list can be seen at the offices of the Board.

A later note from Mr. Cooke, states that as the result of a conference at the Ministry of Commerce to consider to what extent orders for machinery could be placed in Russia itself, it was decided that most of the machines required could be manufactured in Russia, but that as they could not be supplied in time, the orders this year must be placed abroad.

The Board of Agriculture and Fisheries have been informed by the German Ambassador, through the Foreign Office, that a

**Horticultural
Exhibition
at Mannheim.**

Horticultural Exhibition will be held at Mannheim, in the Grand Duchy of Baden, from May to October, 1907, in connection with an International Exhibition of Art.

The gardening exhibition is also intended to have an international character in its most important sections, especially in connection with the cultivation of fruit and vegetables, and the raising of orchids and cactuses. An industrial exhibition is to be attached, in which there will be exhibited the products of the cultivation of fruit and vegetables and the vine, particularly jams, preserved and dried fruits, and vegetables.

Shows of fruit and vegetables, open to foreign exhibitors, will be held on the following dates. The latest dates for receiving applications from exhibitors are given in brackets:—Forced fruit and early vegetables, including asparagus, 18th-21st May [15th April]; strawberries, early cherries, and stone fruit and early vegetables, 8th-11th June [15th May]; early fruit and vegetables, 13th-15th July [15th June]; apples, pears, and stone-fruit, grapes, &c., 10th-12th August [15th July]; autumn vegetables, 21st-24th September [15th August]; collections of fruit new varieties, fruit trees in pots, fruit packing, cold storage, &c., 5th-14th October [15th August].

Applications for information should be addressed to the Office of the Exhibition, Friedrichsplatz 14, Mannheim, Germany. A copy of the provisional programme can be seen at the Offices of the Board, 4, Whitehall Place, S.W.

An international Spring Orchid Show will be held from 7th to 9th May, 1907, applications respecting which should be addressed to Mr. Otto Beyrodt, Marienfelde, Berlin.

The work at the School of Forestry, which has been established by the Commissioners of Woods and Forests in the Forest of Dean, is reported to have made satisfactory progress. As the result of experience the course of instruction has been slightly modified and improved. Seven students entered the school in January, 1904, and completed the course in October, 1905. One has been appointed Assistant Crown Woodman in Windsor Forest, while the others are still in the Forest of Dean. A second class of seven students commenced in November, 1904, two of whom were from private estates, and a third class of eight students began in November, 1905, three being from private estates.

During the year a museum has been built at Parkend, and contains a number of specimens of various timbers, also specimens illustrative of damage caused by animals, insects, fungi, &c. These specimens are being arranged and labelled, and when finished will be of general interest as well as of value to the forest student. The Abbotswood experimental plantation has been made over to the school; about five acres were planted this season with mixtures of various species.

[Report of Commissioners of Woods, &c., 1905-1906.]

Tests for Farmers' Milk.—In connection with the arrangements made in a number of counties in Great Britain for testing milk for farmers, dairymen, and

**Miscellaneous
Notes.**

cowkeepers (see Leaflet 146), Mr. T Hacking, of the Countess of Warwick's Secondary and Agricultural School, Bigods Hall, Dunmow, Essex, has now arranged to carry out tests on similar lines for farmers in Essex at the rate of 6d. per sample. Milk testing has for a long time been taught at this school, and samples have in the past been tested from time to time for milk-sellers and dairymen.

Electricity as a Motive Power on the Farm.—An interesting example of an attempt to use the power from waterfalls for producing electricity is mentioned in *La Nature* (Nov. 24th, 1906), as having been successfully accomplished in France in the department of Aisne. Three falls, situated on two little streams, were employed, giving about 200 horse-power, and to this was added a steam engine of 100 horse-power. Three generating stations were constructed, joined up in such a way that each could supply the whole district, the others being in use according to necessity. Thirteen villages are supplied at varying distances from the central station up to about five miles, the energy being conducted by overhead wires at a high tension (3,200 volts), and transformed at the point of utilization to a low tension (110 volts). Twenty-four motors have actually been installed, seventeen of which drive threshing machines, grain crushers, cake crushers, winnowing machines, &c.; three are in sugar factories, one in a wheelwright's, one in a baker's, and two in flour mills.

In addition to a reduction of cost, it is claimed in favour of the electric motor that it can be used at any time without delay, whereas a steam engine requires time to get up steam; that small farmers can purchase an electric motor at a much less cost than a steam engine; and that a farmer can more fully employ his men, especially when in bad weather they are obliged to return from the fields after perhaps half a day's work.

ADDITIONS TO LIBRARY DURING NOVEMBER.

Canada—

- Bureau of Provincial Information, B.C.*—Bull. 10 :—Land and Agriculture in British Columbia. (80 pp.) 1906.
 Report of the Canadian Forestry Convention, Ottawa, January, 1906. (208 pp.)
Department of Agriculture, Canada.—Veterinary Director-General. Report, 1905. (232 pp.)

Finland—

- Enckell, K.*—Kertomus Mustialan maanviljelys- ja meijeriopiston toiminnasta v., 1905. (219 pp.) 1906.
 Uppgifter om den Engelska Marknaden för Mejeriprodukter och Margarin, 1896–1905. (63 pp.)
Landbruksstyrelsens Meddelanden :—
 No. 43. Växtekultur, Växtförädling och Försöksverksamhet. (158 pp.) 1903.
 No. 44. Redogörelser för Landbruksekonomiska Försök, 1896–1900. (179 pp.) 1903.
 No. 45. Berättelse öfver Skadeinsekters uppträdande i Finland, 1902. (22 pp.) 1903. No. 47. 1903. (27 pp.) No. 50. 1904. (27 pp.)
 No. 46. Landbruksstyrelsens Berättelse, 1902. (240 pp.) No. 49. 1903. (240 pp.)
 No. 48. Berättelse från Mustiala Försöksstations Mejeriafdelning för åren, 1901, 1902 och 1903. (33 pp.) 1905.
 No. 51. Redogörelse öfver Truktodlingen vid Mustiala Institut, 1894–1904. (73 pp. + 21 plates.) 1906.
 No. 52. Meddelanden från Smörlaboratoriet i Hangö, 1904. (30 pp.) 1906.

France—

- Dornic, P.*—La Fabrication du Beurre et le Contrôle des Laites. (67 pp.) 1902.
Lecq, M., et Roiland, C.—L'Enseignement Agricole des Indigènes de l'Algérie. (24 pp.) 1906.
De Liocourt et Parde.—Projet d'Association Forestière. 2 vols. (14 + 12 pp.) 1906.
Rappin, Dr.—L'Immunisation contre la Tuberculose. (31 pp.) 1906.
Loverdo et Mallet.—Les Abattoirs Publics. Vol. I., Construction et Agencement. (902 pp.) Vol. II., Inspection et Administration. (645 pp.) 1906.
 Rapport Budget Général de l'Exercice, 1907 (Ministère de l'Agriculture). (480 pp.) 1906.

Germany—

- Röris, Prof. G.*—Tierwelt und Landwirtschaft. (418 pp. + 5 plates.) 1906.
Congrès international de Botanique, Vienne, 1905.—Règles internationales de la Nomenclature Botanique adoptées par le Congrès. (99 pp.) Résultats scientifiques du Congrès. (446 pp.) 1906.
Glück, Prof. Dr. Hugo.—Biologische und morphologische Untersuchungen über Wasser- und Sumpfgewächse. 1er Teil.—Die Lebensgeschichte der europäischen Alismaceen. (312 pp. + 7 plates.) 2er Teil.—Untersuchungen über die mitteleuropäischen Utricularia-Arten, etc. (256 pp. + 6 plates.) 1906.
Stahl, E.—Die Schutzmittel der Flechte gegen Tierfrass. (19 pp.) 1904.

Great Britain—

- University of Leeds.*—Bull. 62 :—Variations in the Composition of Butter Fat. (7 pp.) 1906.
The Tariff Commission.—Vol. 3 :—Report of the Agricultural Committee, 1906.
Liverpool School of Tropical Medicine.—Memoir XXI. (118 pp.) 1906.
Schever R.—Casein : Its Preparation and Technical Utilisation. (163 pp.) 1906.
 Official Report of the Third International Cotton Congress, June, 1906. (189 pp.)

Holland—

Departement van Landbouw.—Veeartsenijkundige Verslagen over 1904 en 1905. (246 pp.) 1906.

India—

Bombay.—Department of Land Records. Report for 1904-5. (40 pp.)

Bombay.—Report on the Working of the Co-operative Credit Societies Act 1905-6. (22 pp.)

Italy—

Ministero di Agricoltura.—Annali di Agricoltura, 1906.

N. 246. Sul bestiame del Montenegro, della Bosnia-Erzegovina e della Dalmazia. (155 pp.)

N. 248. Concorso a premi tra le Associazioni mutue della Sardegna per l'Assicurazione contro i danni della mortalità del bestiame agrario. (182 pp.)

Norway—

Korsmo, Emil.—Kampen mod Ugræsset. (66 pp.) 1906.

Sweden—

Meddelanden från Kungl. Landbruksstyrelsen:—

N:r 111. Studier och iakttagelser rörande skadeinsekter, Berättelse för 1904. (56 pp.) 1905.

N:r 112. Berättelse öfver Svnseka Smörprofningarna, 1905. (43 pp.)

N:r 113. Meddelanden rörande Mejerihandteringen samt Mejerikatalog. (124 + 65 pp.) 1906.

N:r 115. Beskrifning öfver premierade mindre jordbruk, 1905. (71 pp.)

N:r 116. Berättelse Angående verksamheten vid statens entomologiska anstalt, 1905. (78 pp.)

N:r 117. Berättelse från Sveriges landbrukskonsulent i England, 1905. (26 pp.)

N:r 118. Nötboskapspremiering i Sverige. (78 pp.) 1906.

Switzerland—

Departement de l'Agriculture.—Institutions rurales de Crédit. Les Caisses Mutuelles. 2^{me} Edition. (103 pp.) 1906.

United States—

Hallöck, W., and Wade, H. T.—Outlines of the Evolution of Weights and Measures and the Metric System. (304 pp.) 1906.

Coburn, F. D.—Alfalfa (*Medicago sativa*). (163 pp.) 1905.

Bureau of Animal Industry.—Bull. 31. Tuberculosis of the Food-Producing Animals [with Bibliography]. (99 pp.) 1906.

Bureau of Chemistry.—Circ. 31. General Results of the Investigations Showing the Effect of Salicylic Acid and Salicylates upon Digestion and Health. (12 pp.) 1906.

Farmers' Bulletin 264 :—The Brown-tail Moth and How to Control It. (22 pp.) 1906.

Bureau of Plant Industry.—Bull. 100, Pt. VII. The Effect of Copper upon Water Bacteria. (19 pp.) 1906.

Bureau of Statistics:—

Bull 43. Changes in Farm Values, 1900-1905. (46 pp.) 1906.

Bull 44. Local Conditions as Affecting Farm Values. 1900-1905. (88 pp.) 1906.

United States National Herbarium.—Vol. XI. Flora of the State of Washington. (637 pp.) 1906.

University of Minnesota.—Agricultural Experiment Station. Report, 1903-4 (246 pp.); 1904-5 (283 pp.)

Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of November, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots...	7 11	7 2	37 2	33 5
Herefords ...	7 9	7 0	—	—
Shorthorns ...	7 7	6 11	36 1	32 10
Devons ...	7 10	7 2	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves ...	8	7	8½	6½
Sheep :—				
Downs ...	9½	8½	—	—
Longwools ...	8½	8½	—	—
Cheviots ...	9½	8½	9½	8
Blackfaced ...	8½	7½	8½	8
Cross-breds ...	9½	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs ...	6 8	6 4	6 4	5 9
Porkers ...	7 6	7 0	7 0	6 3
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 6	18 0	22 8	17 7
„ —Calvers ...	20 8	17 3	19 17	17 1
Other breeds—In Milk ...	18 5	15 10	19 8	16 9
„ —Calvers ...	14 17	13 12	19 0	16 1
Calves for Rearing ...	1 19	1 10	1 19	1 8
Store Cattle :—				
Shorthorns—Yearlings ...	9 1	7 12	9 9	7 12
„ Two-year-olds ...	12 13	11 2	13 17	11 13
„ Three-year-olds ...	15 15	14 0	14 8	12 2
Polled Scots—Two-year-olds ...	—	—	14 9	12 9
Herefords— „ ...	14 7	13 2	—	—
Devons— „ ...	12 5	11 6	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Tegs and Lambs—				
Downs or Longwools ...	42 2	36 4	—	—
Scotch Cross-breds ...	—	—	31 7	25 11
Store Pigs :—				
Under 4 months ...	27 11	21 2	21 8	17 7

* Estimated carcase weight.

† Live weight.

**AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of November, 1906.**

*(Compiled from Reports received from the Board's Market
Reporters.)*

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	49 0	46 0	49 6	55 6*	52 6*
	2nd	50 0	44 6	42 0	44 0	52 6*	43 6*
Cow and Bull ...	1st	37 0	42 6	39 0	38 6	42 6	38 6
	2nd	—	36 6	34 6	34 6	33 6	33 0
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	51 0	47 0	—	49 6	—	44 6
	2nd	46 6	43 6	43 0	44 6	—	—
Argentine Frozen—							
Hind Quarters ...	1st	37 0	38 6	38 6	38 6	38 6	37 6
Fore „ ...	1st	32 6	33 6	33 0	32 6	31 0	31 6
Argentine Chilled—							
Hind Quarters ...	1st	42 0	42 6	39 6	38 0	—	40 0
Fore „ ...	1st	33 0	34 0	30 6	30 6	—	32 6
American Chilled—							
Hind Quarters ...	1st	55 6	54 0	52 6	52 0	56 0	54 6
Fore „ ...	1st	36 0	37 0	35 6	35 6	38 0	38 6
VEAL :—							
British	1st	65 6	60 6	68 6	71 0	—	—
	2nd	60 6	43 0	62 0	66 0	—	—
Foreign	1st	70 0	—	—	—	—	63 0
MUTTON :—							
Scotch	1st	73 6	70 0	75 0	76 0	74 6	66 6
	2nd	67 6	58 6	70 0	70 6	60 6	55 6
English	1st	68 6	71 0	71 0	70 6	—	—
	2nd	61 6	56 0	66 6	65 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	66 6	62 0	67 6	—	—
Argentine Frozen ...	1st	38 6	38 6	38 0	38 6	39 0	38 0
Australian „ ...	1st	38 6	36 6	36 0	36 0	39 0	—
New Zealand „ ...	1st	46 6	45 0	47 6	47 6	39 0	—
LAMB :—							
British	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand ...	1st	55 0	55 6	55 0	55 0	55 0	56 0
Australian ...	1st	50 0	50 0	50 6	51 0	53 6	—
Argentine ...	1st	—	—	—	—	—	—
PORK :—							
British	1st	62 6	71 0	70 6	69 0	56 0	57 6
	2nd	55 0	58 6	64 0	64 0	52 6	49 6
Foreign	1st	61 6	70 0	69 6	69 6	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (<i>in</i> 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	2
" 14	26	10	32	3	30	5	18	9	23	10	23	8	17	6	19	7	20	4
" 21	27	7	32	3	30	3	18	10	23	7	23	2	17	6	18	11	20	5
" 28	28	0	32	3	30	5	19	9	23	11	22	4	17	10	19	3	20	2
Aug. 4	28	3	31	11	30	9	19	9	22	0	22	1	17	10	18	4	19	3
" 11	28	4	30	5	30	5	19	9	22	5	23	0	17	7	16	11	17	11
" 18	28	8	28	5	29	0	22	5	23	4	24	2	16	7	16	4	17	0
" 25	29	5	27	1	27	9	23	2	23	6	25	0	16	5	15	9	16	10
Sept. 1	30	2	26	11	26	9	25	3	23	5	24	3	16	3	15	9	16	6
" 8	30	0	27	1	26	4	24	10	23	4	24	9	16	1	15	11	16	3
" 15	29	7	26	11	25	11	24	9	23	7	24	3	15	11	16	0	16	1
" 22	29	10	26	8	25	9	25	10	23	10	24	3	15	9	15	11	16	0
" 29	29	10	26	9	25	9	25	5	24	3	24	8	15	8	16	1	16	2
Oct. 6	30	2	26	9	26	1	25	6	24	9	25	0	15	9	16	3	16	3
" 13	30	5	26	11	26	3	25	4	24	10	25	3	15	8	16	6	16	7
" 20	30	4	27	1	26	6	25	5	25	0	24	10	15	11	16	7	16	8
" 27	30	6	27	4	26	7	24	11	24	11	24	10	15	10	16	8	16	10
Nov. 3	30	6	27	10	26	7	25	0	24	9	24	8	16	0	17	1	16	11
" 10	30	3	28	3	26	6	24	6	24	10	24	8	15	11	17	4	17	1
" 17	30	2	28	7	26	4	24	5	24	6	24	4	16	0	17	8	17	2
" 24	30	5	28	5	26	3	24	4	24	6	24	1	16	1	17	9	17	3
Dec. 1	30	4	28	8	26	1	24	6	24	6	24	1	16	2	17	11	17	2
" 8	30	4	28	6	26	1	24	4	24	7	24	1	16	2	17	11	17	4
" 15	30	4	28	5			24	4	24	5			16	2	17	11		
" 22	30	3	28	4			24	7	24	6			16	1	17	11		
" 29	30	4	28	3			24	8	24	7			16	2	18	1		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: October ...	38 7	39 2	23 10	25 5	20 2	22 7
November ...	38 9	39 6	24 3	26 1	20 8	22 11
Paris: October ...	39 6	40 8	24 2	26 3	20 9	23 1
November ...	39 11	40 4	25 1	26 7	21 7	23 5
Belgium: September...	29 8	28 3	22 8	23 2	18 11	17 11
October ...	30 6	28 7	22 10	24 3	20 0	18 6
Berlin: September...	37 1	38 2	—	—	19 9	21 5
October ...	38 0	38 6	—	—	20 11	22 4
Breslau: September ...	35 1	36 10	25 0	28 8 (brewing) 23 3 (other)	19 2	24 1
October ...	34 1	37 11	25 9	28 8 (brewing) 23 3 (other)	19 1	20 8

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of November, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	29 8	27 6	25 4	25 1	18 8	18 0
Norwich ...	28 5	26 5	24 5	24 7	17 3	16 9
Peterborough ...	27 10	25 4	24 1	23 8	17 1	16 6
Lincoln ...	28 3	25 8	23 10	23 11	17 6	16 9
Doncaster ...	28 1	25 8	23 10	23 9	17 6	16 9
Salisbury ...	28 3	26 8	25 2	24 5	18 0	17 4

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of November, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
British... ..	15 9 per cwt.	14 0 per cwt.	— per cwt.	— per cwt.	— per cwt.	— per cwt.	15 0 per cwt.	— per cwt.
Irish	116 0	114 0	118 6	115 6	117 0	114 0	117 0	—
Danish	125 0	123 0	126 6	122 6	125 0	121 0	124 6	—
Russian	107 0	102 0	122 0	118 0	103 0	96 0	108 0	99 6
Australian ...	117 0	114 6	114 0	—	113 6	111 6	117 6	—
New Zealand...	117 0	115 0	120 0	118 0	114 6	112 6	118 0	—
CHEESE :—								
British, Cheddar	85 0	79 0	— 120 lb.	— 120 lb.	79 0 120 lb.	75 0 120 lb.	68 0	64 0
„ Cheshire	—	—	79 0 per cwt.	73 6 per cwt.	80 0 per cwt.	75 0 per cwt.	—	—
Canadian ...	64 0	62 6	64 6	62 0	62 6	61 0	64 0	61 6
BACON :—								
Irish	60 6	57 6	63 0	59 0	61 6	58 0	63 0	61 0
Canadian ...	56 6	55 6	61 0	59 6	58 6	54 6	58 6	56 0
HAMS :—								
Cumberland ...	109 6	106 6	—	—	—	—	—	—
Irish	106 6	105 0	—	—	—	—	95 6	87 6
American (long cut) ...	64 6	62 0	66 0	62 6	65 0	63 6	66 6	63 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	19 2	17 6	—	—	—	—	—	—
Irish	17 6	14 6	14 6	13 4	13 7	11 10	12 11	12 4
Danish	15 6	13 6	—	—	14 4	13 0	14 0	13 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
British Queen	71 0	61 0	—	—	55 0	50 0	45 0	40 0
Scottish Triumph	—	—	71 6	60 0	51 6	46 6	—	—
Up-to-Date ...	72 6	61 6	71 6	58 6	55 0	46 6	46 0	41 0
HAY :—								
Clover... ..	103 6	92 0	84 0	76 0	96 0	71 0	78 6	73 6
Meadow	95 0	84 0	72 6	66 6	—	—	75 6	72 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	136	45	1,095	725
Swine Slaughtered as diseased or exposed to infection ...	793	232	6,286	3,276
Anthrax :—				
Outbreaks	78	69	833	879
Animals attacked	102	83	1,184	1,197
Glanders (including Farcy) :—				
Outbreaks	78	82	996	1,112
Animals attacked	141	137	1,881	1,905
Sheep-Scab :—				
Outbreaks	63	65	395	778

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	NOVEMBER.		11 MONTHS ENDED NOVEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	7	2	91	137
Swine Slaughtered as diseased or exposed to infection ...	23	12	971	1,415
Anthrax :—				
Outbreaks	1	—	4	3
Animals attacked	1	—	8	5
Glanders (including Farcy) :—				
Outbreaks	—	3	8	29
Animals attacked	—	8	16	100
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	27	28	213	277



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FARM BUTTER-MAKING.

The making of butter on the farm can only be regarded as a profitable means of utilizing milk under certain circumstances, such as: (1) When there is practically no local demand for whole milk and the distance from a railway station is excessive; (2) When the quantity of milk produced on the farm is not sufficient to pay for its portorage by road or rail to market; (3) When the net value of whole milk is very low indeed; (4) When the making of cheese or disposal of cream cannot be carried out satisfactorily; (5) When the butter can be sold retail at a good price. Under any of the above circumstances, butter-making may be made a financial success provided other conditions are favourable. For instance, it is necessary that the land, water supply and buildings should be adapted for the purpose of dairying, and that the cattle should be bred, selected and fed so as to be capable of yielding rich milk. Profitable ways of utilizing the separated milk and the butter-milk must be found either for stock feeding or for commercial purposes.

Butter Ratio.—Before giving particulars of the butter-making dairy, the term “butter ratio” may be explained. This expression really means the ratio of butter produced to the milk used, but is generally understood by dairymen as the amount of milk it takes to make one pound of butter. Thus, roughly grouping

A A A

the milk of some of the most important of the dairy breeds according to the butter yield :—

Shorthorns	}	Produce 1 lb. of butter from 23 to 30 lb. of milk.
Welsh		
Redpolls		
Ayrshires		
South Devons	}	Produce 1 lb. of butter from 20 to 24 lb. of milk.
Kerries		
Dexters		
Jerseys	}	Produce 1 lb. of butter from 15 to 20 lb. of milk.
Guernseys		

The cattle therefore most suitable for butter-making, always supposing that the climatic conditions are not unduly severe, are those of the Channel Island breeds, or animals that have some cross of these in their blood.

To find out the quality of milk, a sample that has been very thoroughly mixed may be sent either to an analyst, a County Council Institution where cheap analyses are made (see Leaflet No. 146), or tested at home by the use of the Gerber or some other rapid butter-fat finder. The evening's milk is in nearly all cases richer, or contains a larger percentage of fat, than that given in the morning. The yield of butter from 100 lb. of milk of known quality may readily be calculated. All that is necessary is to deduct the normal amount of loss of fat, viz., '2 per cent., which occurs in the separated milk and butter-milk during separating and churning, and calculate on the amount of fat there is present in the finished butter, so obtaining the actual yield of butter. Thus for example:—To find the number of pounds of butter produced from 100 lb. of milk containing 3·6 per cent. of fat :—

$$\frac{(3\cdot6 - \cdot2) \times 100}{85} = \frac{340}{85} = 4$$

In this case 4 lb. of butter are obtained from 100 lb. of milk. The figure 85 represents the amount of fat in 100 parts of butter. If 4 be divided into 100 the result (25) represents the amount of milk taken to produce 1 lb. of butter, so that the butter ratio is 1 : 25. For butter-making it is desirable to keep cows that give from 4 to 5 per cent. of butter-fat. The milk of Shorthorns and many other breeds is improved in churnability by the admixture of a small quantity of milk from the Alderney

type of cattle. As well as increasing the yield of butter it greatly improves its colour.

The Dairy.—There are advantages on the score of sanitation in having the dairy away from, rather than attached to, the house or homestead. In either case the building should comprise : (1) A cream-ripening room, where the temperature can be to some extent controlled ; (2) The dairy proper, where the churning is done. The best dairies have a northern aspect, double walls, and a cement or asphalt floor, and are provided with plenty of light and ventilation ; and (3) A scullery or covered yard where provision is made for hot and cold water.

An ample supply of water is one of the most important factors in successful butter-making. Rain water is not suitable for use in butter-making except for washing floors. Too much stress cannot be placed upon the necessity of having a plentiful supply of pure cold water. Any contamination from want of good drainage or other causes means disaster so far as the production of good keeping butter is concerned.

Utensils.—The following list comprises those articles in general use which are usually kept in the dairy :—

A churn, size according to the amount of cream.	Set of scales and weights.
A butter worker.	Set of measures varying in size from 1 qt. to $\frac{1}{4}$ pt. capacity.
Two hair sieves.	Straining cloths.
Butter boards.	Butter muslin.
Two pairs scotch hands.	Grease-proof butter paper.
Butter scoop.	Dry salt.
Floating thermometer.	Set of brushes.
Cream squeegee.	Small railway milk churn for separated milk.
Light steel pails of 14 quart capacity.	Lime, &c.

The Cream-Ripening Room.— *The Scullery.*—

Enamelled cream pails.	Hand or power separator.
Drums for cream ripening.	Steel milk pails.
Shallow setting pans.	Railway milk churns.
An acidimeter for ascertaining when cream is ripe and ready for churning.	Milk strainer.
	Hot and cold water supply.
	Floor squeegee, mop and brushes.
Wall and floating thermometers.	
Heating stove. Chip boxes, &c.	

Other appliances not mentioned in this list but which will be found most useful when any considerable quantity of milk has to be dealt with are a refrigerator or cooler, with a cooling capacity of 120 gallons of milk per hour, which can be used for cooling both cream and separated milk; a box refrigerator to harden the butter after making, and in which to store it till sold; a Gerber or other milk tester; and a dairy herd recorder for weighing and recording each cow's milk. In practically all cases the most economical method for the production of cream is by means of the hand or power separator.

Cream Ripening.—Butter can be produced by churning from:—(1) Sweet cream; (2) Sour or ripened cream; (3) Ripened whole milk; (4) Devonshire cream. Although sweet cream butter is much appreciated by some, it is usual in most farm dairies where churning takes place once or at the most twice a week for sour cream alone to be dealt with. Cream ripening is brought about in two ways:—1st, by natural means; 2nd, by the aid of starters. The natural way is to allow the cream to stand from two to three or four days, according to the weather, in a pure atmosphere at a temperature of 60 to 68 deg. Fahr., or say two days in summer and three or four in winter. The cream should be stirred frequently and the receptacle containing it covered over with a muslin cloth. Souring or acidifying will then take place naturally, but if required it may be promoted by the following means:—

1. Adding butter-milk at the rate of about $\frac{1}{2}$ a pint to each gallon of cream. Great care must be taken that the butter-milk used comes only from a churning of really good flavoured butter.

2. Heating the cream up to 90 deg. Fahr. and then allowing it to cool slowly.

3. By the addition of about 10 per cent. natural starter. Natural or home-made starter may, with care, be prepared on the farm, and the method of its production is to:—

- (a) Let one quart of clean new milk be left in a pure atmosphere of 70 deg. Fahr. for 24 hours so that it sours and thickens.
- (b) Skim off the cream which has come to the surface at the end of this period.

- (c) Stir the remainder and put it in a couple of gallons of separated milk which have been *previously* heated or pasteurised up to 185 deg. Fahr. for about 20 minutes and cooled to 70 deg. Fahr.
- (d) Next day, after discarding the surface layer, take one pint of the soured two gallons and put it into two more gallons of milk as in (c).
- (e) After the lapse of another 24 hours the "starter" is ready for use.
- (f) It must be renewed daily in summer and about twice a week in winter, so as to keep it in sound condition for use.

Working Temperatures.—Different lots of cream of varying freshness should not be mixed just before churning. Twelve hours should at least elapse from the time of the last addition of fresh cream to a ripened lot before churning takes place. The temperature of the dairy should be noted before work begins. Normally, cream may be churned at about 57 deg. Fahr., a much lower temperature being required in summer than in winter. In summer it may vary from 52-56, and in winter from 58-65 deg. Fahr. It is recommended that temperatures should be taken at different stages of the work and recorded under the following headings, so that information is obtained that may be utilized at future times :—

Temperature of Dairy.

Temperature of Churn.

Temperature of Cream.

Temperature at "Breaking" stage.

Temperature of Breaking Water.

Temperature of Washing Water.

Temperature of Brine.

A small quantity of cream may be warmed by standing the pail containing it in hot water, and keeping the cream stirred during the process. It may be cooled by standing the pail in water at a lower temperature than the cream. Where ice is not available well water may be used, but if this is not cold enough then brine can be made to reduce the temperature.

Preparation of Utensils.—The churn, butter worker, scotch

hands, &c., may be prepared for use in the following manner:— (1) Scald with boiling water and ventilate the churn immediately it is set in motion, scrub all with suitable brush ; (2) Rinse with cold water and drain it off ; (3) Rub the inside of the churn with salt, also the worker (it is not necessary to do this each time) ; (4) Rinse again with cold water, leaving some on the worker and some in the churn, until the cream is ready to be put in. Wrap a wet butter muslin round the roller of the worker and place another damp cloth over the butter board.

Churning.—Strain the cream into the churn but do not more than half fill it. Churn slowly at first, ventilating frequently, and then gradually increase the speed of the churn to about 55 revolutions a minute. The time taken in producing the butter varies considerably, and depends upon the kind of churn used, on the temperature, ripeness and thickness of the cream, period of lactation of the cows, and concussion produced in the churn. Generally speaking, the butter should “come” in thirty to forty minutes, as under these circumstances the best results are obtained. Stop churning as soon as the butter “breaks,” that is, as soon as the cream is changed into the form of fine grains of butter. This stage is indicated by the clearing of the glass window in the lid, and by the dull thud of the “broken” cream falling inside the churn. If in doubt as to whether this stage has been reached, open the churn and see the condition of the cream ; should the cream become sleepy it is necessary to add water to thin it down and regulate its temperature. At this time add a quart or so of cold breaking water for each gallon of cream in the churn and then continue churning until the butter grains are of the required size. The best size is on the average about that of turnip seed. In no case should the butter be churned into lumps, as then too much curd is enclosed which it is impossible to get rid of during the washing, and as a consequence the keeping qualities of the butter are greatly reduced. Draw off the butter-milk through the hand sieve over which a piece of muslin has been tied.

Washing and Salting.—The temperature both of the washing water and of the butter inside the churn should be taken at this stage. To harden the grain bring the temperature of the water down ; to soften the grain warm the water a few degrees. An

example taken in November is as follows :—The dairy was 54 deg. Fahr., the cream 60 deg. Fahr., and the final washing and brining 52 deg. Fahr. The cream was fairly thin and took twenty-five minutes to churn, and the butter grain obtained were just of the right degree of hardness for making up. Two washings are usually sufficient to get rid of the most of casein, but if a third is given the keeping qualities are greatly increased. Brine is made by dissolving salt at the rate of 1 to 2 lb. in each gallon of water. The butter grains should be allowed to soak in the brine for about twenty minutes and then removed by means of a scoop and sieve from the brine to the worker. Dry salting is the more usual method of salting to adopt. The salt used should be fine, dry and clean, and it is added to the butter grains on their removal from the churn to the butter worker before the roller is brought into use. From $\frac{1}{4}$ to $\frac{1}{2}$ oz. of salt to the pound of butter is a suitable quantity to add to give mild and medium salt butter.

Working.—The butter grains having been removed from the churn to the worker by means of the perforated wooden scoop, working may be commenced. In hot weather a damp cloth should be placed over the butter, and it should then be left to harden in the coolest place available. In some cases it is best left in brine in order to harden it. The object of working is to get rid of the moisture with as little injury to the grain as possible. Great care is needed in the operation, for well-churned butter is frequently spoiled from the rough and clumsy use of the roller at this stage. The Sale of Butter Regulations provide for a maximum of 16 per cent. of water in butter, but this quantity would be considered excessive in most farm-made samples, and the value accordingly reduced. The amount of water usually present in butter of the best quality is about 12½ per cent.

Washing Up.—Wash all utensils with warm water to remove grease from them. Scald the churn with boiling water and ventilate on first and subsequent revolutions. Remove the rubber band from the lid and keep all metal parts of the churn oiled. The ventilator should be taken to pieces occasionally and the parts carefully cleaned. The butter worker often becomes sticky, and the rolling of the butter is then made difficult and

unsatisfactory, as the butter sticks to the wood. As a remedy wash the wooden parts with soda, or scrub with finely-ground lime. If the wood becomes rough through wear the worker should be taken to pieces and the wood carefully planed and sand papered.

Making Up and Marketing.—Scotch hands are employed in making up the butter into various shapes, such as bricks, rolls and fancy forms. A pound print of a useful packing size measures $4\frac{1}{8}$ inches by $2\frac{1}{2}$ inches by $2\frac{3}{8}$ inches. Neatly made blocks of butter with square ends and printed with some fancy design are undoubtedly the most attractive form of make up. Butter neatly made up and presenting an attractive appearance has an increased value. A large number of persons are attracted by butter neatly presented, and will pay rather more for it. Chip or card boxes, which can be bought at very reasonable rates, are useful for packing purposes. The butter should first be wrapped in grease-proof paper and then inserted into the box, on which may be printed the name of the maker or some attractive title. When a good article can be manufactured and the product turned out of uniform quality throughout the year, a satisfactory price can usually be obtained, as there is always a good demand for well-made farm butter.

Colouring and Preserving of Butter.—As already mentioned, a portion of milk from Channel Island cattle improves both the colour and flavour of butter. Feeding cows with 10 lb. and more per day of red carrots has also a marked effect in improving the colour and texture of butter. Farm butter that has been well washed and worked in the granular stage to expel as much moisture as possible, will keep good for a considerable length of time. It should keep well from ten days to a fortnight in summer, and up to six weeks in winter, if stored in a cool place.

POTTING BUTTER FOR WINTER USE.—Butter that is to be potted down should be made from sour cream, treated in the way just described. One oz. of dry salt is added to each pound, and the butter very thoroughly worked, so as to get it nice and dry. Glazed crocks that have been well cleaned are used for packing it into, and it should be well consolidated. The butter, after being well pressed down, is covered with a

thick layer of salt on the top. A piece of parchment paper should be tied tightly over the crock, which must be stored in a cool dry place. Butter so treated will keep for several months. On removal it should be soaked for some time in water of about 65 deg. Fahr., re-worked and then made up.

JUDGING BUTTER.—A scale of points useful for judging butter is as follows:—Flavour, 40; aroma, 10; texture, 20; evenness of salting and freedom from moisture, 15; colour, 5; neatness of make-up and finish, 10.—Total, 100.

THEODORE R. ROBINSON.

C. W. WALKER-TISDALE.

THE BLACK CURRANT GALL-MITE.

(*Eriophyes ribis*, Nalepa.)

Of the many pests which levy toll upon fruit trees in this country, few, if any, have caused more damage and loss than the black currant gall-mite. Certainly none have so baffled the efforts of fruit growers and others to eradicate it.

Towards the close of the last century it was increasing and infesting new bushes in the Midlands to an alarming extent, so that it was quite the exception to find bushes free from the disease known as "big-bud," and many growers were giving up the cultivation of black currants.

So serious had the matter become towards the close of 1898 that I was appealed to by numerous growers to endeavour to provide some effective means of stamping out what they described as the "worst fruit pest in the country."

As a result I commenced early in 1899 a series of experiments which have now extended to the end of 1906, and have resulted in a practical and effective cure which can be easily applied at a relatively small cost. It has been represented to me that some account of the various experiments and the work done would prove of interest and value to growers; and

although the work has been reported upon in 1904,* 1905,† and 1906,‡ and a further report will be issued shortly, a general *résumé* of the work up-to-date may prove useful.

When the work was commenced there was little reliable information respecting the life-history of this particular species. It was, therefore, absolutely necessary to make a careful and detailed study of the mite and its habits. Before the work was sufficiently advanced to publish an account of these investigations, various papers were published which deserve mention.

Firstly, in 1901,§ Mr. Robert Newstead issued a valuable paper, in which much of the life-history was given, together with an account of various experiments with different insecticides, &c.

This was followed in 1902|| by a very full and interesting account by Mr. E. J. Lewis, the most complete account which had up to that time been given. Later in the same year Mr. Cecil Warburton and Miss Embleton added a number of interesting facts.¶

In 1904 I issued an account of the results obtained from my five years' work, and numerous short accounts of the mites' life-history have since been published, compiled from the above-mentioned papers.

Extensive spraying experiments were carried out at Woburn, and an account of these was given in the Second Report of the Woburn Experimental Fruit Farm in 1900 (see pp. 13—20).

The Black Currant Bud Disease.—The appearance of diseased plants has been described by Newstead.** It is not difficult to recognize. If we take a portion of an infested tree, it will be noticed that certain of the buds have a distinctly globular or swollen appearance and are more or less distorted, whereas the normal buds are smaller and conical. When buds are badly attacked they never open into leaf, but for a time they retain

* "Some Recent Investigations on the Black Currant Gall-Mite." Birmingham, 1904.

† "Report on the Injurious Insects . . . observed in the Midland Counties during 1904." Birmingham, 1905.

‡ "Report on the Injurious Insects . . . observed in the Midland Counties during 1905." Birmingham, 1906.

§ Journal, Royal Horticultural Society, 1901, vol. xlv., pp. 1-15, 7 text figs.

|| "Rpts. S.-E. Agric. Coll., Wye, 1902," pp. 1-26, 1 plt. and 1 text fig.

¶ "Linn. Soc. Journ.—Zool.," 1902, vol. xxviii., pp. 366-378, pls. 33, 34.

** Journal, Royal Horticultural Society, 1901, vol. xxv., pp. 1-15, 7 text figs.

their green colour, later becoming brownish, dry, gall-like bodies, more or less open at the apex. Other buds not so badly infested as those above mentioned put forth diminutive shoots and small leaves. As the disease increases by spreading to more buds, it is noticed that owing to the failure of infested buds to leaf, next year's buds are prematurely forced into development, and so the plant's vitality becomes reduced. If this continues, as it usually does, the plant is soon unable to respond to the excessive drain upon it, the food stores become used up, and ultimately the plant dies.

It sometimes happens that a badly infested tree, by reason of the few buds left, or that the plant is capable of developing, becomes after a year or two almost free from mites, but as soon as any number of buds commence to develop they are rapidly tenanted by mites and the plant very quickly dies.

Life-History.—Very briefly the life-history may be summarized as follows:—

If an infested bud of the black currant plant be opened about the middle of March it will be found to contain numerous mites and eggs; and if the temperature is favourable, mites may be seen crawling at the bases of the buds and on the stem, these having been forced to quit the partially infested buds, which now commence to germinate. Most, if not all, of these mites die. Towards the middle of April or early in May the mites commence to migrate from the abortive buds, and this continues through May, attaining its maximum towards the end of the month and gradually becoming less and less until the middle of June. During the latter part of May and the earlier part of June the mites may be found all over the stems, and early in June they commence to make their way into the new buds. Of the many thousands which leave the old buds, only a very small proportion reach the new buds. But most of the migrating females are full of eggs, and these are laid soon after an entrance is effected in the new bud. After about twelve or fourteen days eggs and mites in all stages of development are present in the centre of the bud, and the latter now commence to work their way outwards. They have not, however, been seen to leave the buds until early in August, and then only in small numbers, and were last

noticed on the stems so late as September 20th in 1901, September 14th in 1902, and October 28th in 1903. During the migration period thousands of mites fall off the branches to the ground, many are distributed by birds, insects, arachnids, leaves, &c., to other bushes, the remainder dying.

It has already been pointed out that about the middle of June eggs and mites in various stages of development are to be found in the centre of the new buds. During the winter of 1902-3 one or more buds were examined once a week from September to March, and in nearly all cases eggs were found to be present. They were certainly very few in number from December, 1902, to March, 1903, and it seemed to me that many of them were dead. From October 14th, 1903, to January 30th, 1904, buds were taken from another tree and examined once a week, but, in spite of the most careful searching, no eggs were discovered after October.

The newly infested buds commence to swell and become irregular in shape towards the end of August or the beginning of September.

The dates of appearance, migration, &c., for the years 1899-1906 may be summarized as follows :—

—	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Eggs found	—	All the year	round	(see paragraph above).				
Mites appear	Mar. 26th	Mar. 26th	Mar. 24th	Mar. 28th	Mar. 26th	Mar. 28th	Mar. 22nd	Mar. 20th
Old infested buds dry up	May	May	May	May	May	May	May	May
Migration commences	April	April 19th	April 12th	April 30th	April 26th	April 15th	April 20th	April 13th
Migration ceases	—	June 19th	June 14th	June 8th	June 21st	June 6th	—	—
Mites found in new buds	—	July 2nd	June 28th	June 19th	July 3rd	July 1st	—	—
Eggs in new buds	—	—	—	—	—	—	—	—
Mites last seen	Sept. 4th	Sept. 18th	Sept. 20th	Sept. 14th	Oct. 28th	Oct. 4th	—	—
New buds commence to swell	Sept. 20th	Sept. 10th	Aug. 23th	Sept. 20th	Sept. 14th	Sept. 7th	—	—

The number of stages which the mite passes through is not definitely known ; there are certainly two before attaining the adult condition.

Methods of Distribution.—The ordinary method of locomotion is by crawling, and this is carried out by means of two short pairs of legs and with the aid of the tail. As was first pointed out by Mr. Warburton* the mites are often to be seen

* *Op. cit.*, p. 371.

“standing on end, and motionless, except for the waving of their legs.” They obtain a firm hold with the tail-disc and seem to wait three or four minutes in this position hoping to attach themselves to some insect or arachnid. The same author also draws attention to a method they have of leaping. When this work was first commenced I was often puzzled to find, that when examining the mites under the microscope, they often suddenly disappeared from the field of vision ; this happened so frequently and so rapidly, that I came to the conclusion that those mites which were standing upright were capable of suddenly throwing themselves forward by the action of the tail-disc. Mr. Warburton mentions that the longest distance covered by a leap measured four millemetres, but I have frequently seen this distance increased by two or three millemetres.

In addition to these three methods, I have noticed that at times the mites will roll the abdominal portion over towards the head, and lying on their backs with their legs actively waving, will remain so for one or two minutes, and then suddenly straighten themselves again with such force as to carry them two or three millemetres.

Varieties of Plants Attacked.—It has been thought by some observers and growers that certain varieties were practically immune, but I cannot say that my experience lends any support to such views ; on the other hand, I have taken mites from the Baldwin and transferred them to most of the known varieties, and also from infested specimens of these varieties which have been sent to me and infected others. Mr. E. J. Lewis states that he has never found the old varieties to be attacked in Kent.*

Remedial Measures.—The suggested remedies are numerous, but up to the present time none excepting the lime and sulphur have resulted in exterminating the mite or diminishing the disease to any appreciable extent.

The various remedial measures may be considered under four heads, viz. (i.) fumigation, (ii.) spray fluids, (iii.) natural enemies, (iv.) miscellaneous.

(i.) *Fumigation.*—Fumigation with hydrocyanic acid gas has

* *Op. cit.*, p. 10.

been experimented with both at home and abroad with a view to exterminating this and other species of mites. Mr. E. J. Lewis, after a series of experiments in 1900 and 1901, writes,* "the results of these experiments . . . show that fumigation will, in most cases, diminish the attack by destroying a great number of the mites, but that apparently it has no effect upon the eggs, and will not entirely get rid of the disease. . . . It is doubtful if any alteration in the amounts of the chemicals used or in the length of time during which the bushes are under treatment would be able to effect a permanent cure."

This is entirely in accord with my own experiments, and with the opinions of all whom I have known to try fumigation. Further, it may be pointed out that the fumigation of bushes covering large areas is only carried out with great difficulty; most of the experiments made have been upon cuttings and young bushes before being planted out, but cuttings should not require fumigation, for surely no responsible person will take cuttings from infested bushes, or buy plants without knowing they have been examined by an expert and pronounced free from disease. Mr. Warburton, in his annual Report for 1902,† writes "that great benefit would accrue both to sellers and buyers of black-currant cuttings if those who supply them would have their crops examined by an expert to determine whether the mite is present or not. A certificate of freedom from the disease would be of considerable value to the possessor of a fine crop, and buyers would be only too glad to be sure that the cuttings supplied to them came from a pure stock. I would suggest, in the first instance, that any who believe that the disease is not present in their plants, and who are willing to supply cuttings, should have their fruit gardens visited by an expert and reported on, and that those . . . who require cuttings should insist upon some attestation of the purity of the plants from which they are taken. In this manner much would be done to gradually stamp out the disease." This suggestion I most heartily endorse, as the importance of obtaining pure stock cannot be over estimated.

(ii.) *Sprayfluids*.—The only time sprayfluids can be used to

* *Op. cit.*, p. 26.

† *Journal*, Royal Agricultural Society, 1902, vol. 63, p. 305.

any purpose is during the season of migration.* The extensive experiments carried out at Woburn with petroleum, calcium sulphide, carbolic acid, antinonnin, &c. (where thirty bushes in a double row were treated once a month for each experiment), proved ineffective, as did also undiluted methylated spirits, naphtha, a saturated solution of naphthalene in naphtha, a 2 per cent., a 0.5 and a 0.1 per cent. solution of formalin, turpentine, undiluted petroleum, and petroleum emulsion: 1 part of petroleum, 5 parts of water, and 2 of soft soap, applied once a month with a brush.

I have made experiments with various arsenical fluids, bruised hellebore, lime, sulphur and lime, &c., &c., and while many have considerably reduced the numbers of the mites only the lime and sulphur have any practical value.

In 1901 some small bushes which were very badly infested were treated with the following sprayfluid twice a week during the migration season: Sulphur, 2 lb.; soft soap, 25 lb.; water, 50 gallons, made as follows:—Mix the sulphur to a gruel with water, the soft soap should be mixed with 5 gallons of boiling water; then add the two mixtures together and mix well, after which add slowly sufficient water to make 50 gallons.

The results obtained from the use of this sprayfluid are very encouraging. The new buds which came out in 1901 were very carefully examined until nearly the end of the year, and on only one bush were mites found in them, and only very few, the actual numbers in the different buds examined in August, 1901, being: 12, 3, 7, 5, 3, 3, 12, 3, 7, 7, 6, 5, 3, 12. In 1902 these same bushes were under constant observation, but no mites were seen or any indication of them. As these bushes were growing not far from some infested bushes they were sprayed during the migration season as in the previous year. In 1903 they still remained free from mites, and an examination of almost every bud on one particular tree at the beginning of 1904 failed to discover either mites or eggs, and all the trees were free of abnormal buds.

These experiments, although very successful, were not of the nature that a fruit-grower could apply at a cost which would repay him for the extra labour involved, although certain

* Recently certain writers have suggested spraying or treating the bushes in January.

growers have given the sprayfluid a trial with very satisfactory results.

The two main objections to the soap and sulphur sprayfluid were, firstly, the large number of applications which were given in my experiments, and, secondly, the large quantity of soap used. But once having proved that the mite could be destroyed by the use of sulphur, it remained to be demonstrated in what form it was best applied, and whether or not it could be shown that any benefit resulted from a smaller number of applications.

With these two objects in view, a series of experiments were commenced early in 1905 on a piece of land set apart and prepared for the purpose by the Council of the University of Birmingham.

On this plot seven rows of bushes were planted, consisting of Black Naples, Baldwins, and Boskoop Giant. All were as badly infected with "big-bud" as it was possible to obtain; indeed, I have never seen worse. The plot of land was far from an ideal one, and the last that a fruit-grower would have chosen, so that the bushes had no natural advantages in their favour.

The experiments were carried out as follows:—Rows 1, 2, and 3 were dusted with equal parts of unslaked lime and flowers of sulphur. Rows 4, 5, and 6 were sprayed with a mixture consisting of 1 lb. lime, 1 lb. sulphur, and 20 gallons of water; whilst row 7 was sprayed with a mixture consisting of 1 lb. sulphur, 1 lb. of soft soap, and 20 gallons of water.

(a) *Dusting with Lime and Sulphur.*—As it was desirable to find, if possible, the minimum number of applications that would give successful results, row 1 was dusted three times, row 2 twice, and row 3 once. The dustings were applied when the bushes were wet on March 31st, April 14th, and May 5th. A small pair of bellows were used for the purpose, but better results have since been obtained by the use of the "Coronette" Knapsack Sprayer.

At the end of June all the bushes were in full leaf, and excepting here and there, where the growing points had been slightly burnt by the lime, they all looked remarkably healthy.

The remains of the old diseased buds were microscopically

examined, but no mites were found, nor could any trace of big buds be discovered on any of the bushes.

In September buds were taken from the different bushes, particularly those buds which appeared big or at all irregular in shape. These were carefully treated by what is known as the Nalepa and other methods; numerous slides were made and examined under the microscope, with the following results:—

Row 1.—Out of a large number of buds examined, only two were found containing mites; in one there was a single immature specimen, and in the other there were five examples, also immature.

Row 2.—Very few mites were found, but there were more infected buds; the largest number of mites found in a single bud was seven. In all cases the mites were immature.

Row 3.—Here the buds differed very little from those taken from row 2, only the percentage of infected buds was slightly greater.

It is very evident that all the bushes benefited by the application of the lime and sulphur. It would have been better, however, had a little less lime been used (*1 part lime to 2 parts of sulphur has acted as well*). In the case of those bushes that received a single dusting, the big buds were considerably reduced in number, not more than one-quarter of the number being present in October of those present in February. Where two dustings were given, a distinctly marked diminution over those receiving one dusting was shown; whilst where three dustings were applied the mite was almost exterminated. It must be borne in mind that neither a sprayfluid nor dry application will reach the eggs in the buds, and it seems clear that the number of adult mites which successfully migrated from the old buds into the new ones was very small indeed. In all cases the mites found were immature specimens.

(b) *Spraying with Lime and Sulphur*.—The results obtained by spraying were not so good as those by dusting. A larger number of buds were affected, and in many of them there were adult and immature mites and eggs. The differences between the one, two and three applications of the sprayfluid were quite in keeping with those found to obtain where dusting

had been done. The fewer the applications, the greater the number of mites.

(c) *Spraying with Soft Soap and Sulphur*.—Row 7 was sprayed twice with the above mentioned sprayfluid. When the bushes were examined in October a fairly large number of big buds were noticed; there were, however, nothing like so many as in the previous February; roughly estimated, I should think about one-third the number. In many of these buds twelve to twenty adult mites were present, many immature specimens, and a few eggs. The result of examining eighty-six suspected buds showed an average of four adults, nine immature mites, and three eggs per bud.

These experiments were continued during 1906, one part of lime being used to two of sulphur. Further, many fruit-growers in different parts of the country took up the matter and gave this method a trial. It is not necessary to detail here all of the results individually. Throughout they proved completely successful, and the two following may be taken as typical replies to an inquiry as to the results:—

"The plantation was one badly infested with 'big bud,' and the lime and sulphur has effectually eradicated the mite."

"Thanks to the lime and sulphur treatment, our bushes are now mite-free. The cuttings enclosed will bear out our statement."

(iii) *Natural Enemies*.—As in the case of other species of *Eriophyes*, there are associated with this species mites of other families as well as various insects. The following have been met with:—Species of *Tetranychus*, *Tyroglyphus*, *Tarsonemus*, *Bryobia* and *Sejus* (E.J.L., *op. cit.*), *Oribatidæ*, *Actineda* (C.W., *op. cit.*) which possibly feeds upon the *Eriophyes*, Thrips, and the larva of a dipterous fly, which last Mr. Warburton (*op. cit.*, p. 375) states feeds upon the mites, larvæ of the lacewing fly (*Chrysopa*, sp.), also a species of hover fly (*Syrphus*, sp.) (R.N., *op. cit.*, p. 9).

In addition to these, reference must be made to the larva of the ladybird beetle (*Coccinella septempunctata*, L.).

During 1902 and 1903 I had a series of badly infested cuttings under observation, and these were practically all cured by keeping them artificially supplied with this beetle. The 1902

cuttings exhibited very few, and only slightly, abnormal buds in the autumn, while in 1903 they seemed entirely free. Unfortunately this species of ladybird does not seem particularly fond of the black currant, but in my own mind I have little doubt but that a species could be found which, if bred in sufficient numbers, would materially lessen and keep in check this disease, and possibly might exterminate it.

(iv) *Miscellaneous*.—Amongst other remedial measures which have been suggested and tried may be mentioned hand picking infested buds. Experiments carried out at Woburn* have clearly demonstrated the uselessness of this method, for the Report states :—" In 1896 the Baldwins showed signs of being attacked by the mite, and all the bushes were carefully examined and the galls removed. In spite of this, however, the infestation had increased to a marked extent in the following year, and had spread to a certain degree to the Black Naples. The galls were again removed in 1897, but a still further increase in the severity of the attack was noticed in 1898. Such observations must throw considerable doubt on the removal of the galls as a remedial measure, though it is frequently advocated. It might, it is true, succeed when assiduously followed in a very small plantation, but when attempted on a larger scale it seems to have but little effect. . . . As further evidence we may cite the following cases, in which we selected five bushes of Baldwins and counted the number of affected buds on them in January, 1898, 1899, and 1900 respectively, the affected buds having been removed before growth in each year named. The data were as follows :—

—	1898.	1899.	1900.
Bush No. 1 ...	13	26	369
" " 2 ...	134	236	1,550
" " 3 ...	68	267	1,298
" " 4 ...	286	620	1,796
" " 5 ...	432	648	1,862
Total ...	933	1,797	6,875

" Thus, in spite of the affected buds having been removed each year, the number of buds affected at the end of the season has

* Second Report Woburn Experimental Fruit Farm, 1900, pp. 13-20.

been doubled in one case and increased four-fold in the other. There appears, therefore, to be no prospect of checking an attack in this manner."

Further and similar experiments are recorded by the late Miss Ormerod,* which were carried out by Mr. C. D. Wise, manager of the Toddington Fruit Grounds, Winchcombe, Gloucestershire. She writes:—"Where we have picked the gall-mites off last autumn the attack seems to be quite as bad this spring."

Finally, Mr. Newstead† states that hand-picking has met with a fair amount of success in small isolated plots, which agrees with my own experience.

Pruning and cutting down the bushes has proved ineffectual as has also planting red and black currants in alternate rows.

Cutting down bushes and steeping the roots in dilute methylated spirits has tended to reduce the number of mites, but has not proved of permanent value.

Conclusion.—After the experiments which have been made, I feel convinced that the application of lime and sulphur will keep this mite in check, and if the dusting or spraying is continued will eventually entirely eradicate the pest.

Various statements have appeared in a section of the horticultural and agricultural press stating that there is no likelihood of a cure, or even of means whereby the mite can be kept in check, and further that its life-history is very imperfectly understood. I would warn all fruit-growers against such misleading statements. The life-history is now practically fully known, and the experiments which I have conducted, and which have now extended over eight years, have yielded results, checked by many large fruit-growers, which clearly point to the fact that the application of lime and sulphur offers an effective remedy.

WALTER E. COLLINGE.

* Report of Observations of Injurious Insects during the year 1897, p. 150.

† *Op. cit.*, p. 10.

REPORT OF THE SMALL HOLDINGS COMMITTEE.

In April, 1905, the President of the Board of Agriculture and Fisheries, the Right Hon. Ailwyn E. Fellowes, M.P., appointed a Departmental Committee to enquire into the subject of Small Holdings in Great Britain, and this Committee has now issued its Report (Cd. 3,277, price 6d.).* The terms of the reference to the Committee were "to enquire into the administration and working of the Small Holdings Act, 1892; to examine the various arrangements made by landowners in recent years for the provision of smaller agricultural holdings; and to report as to the conditions under which such holdings are most likely to be attended with success, and as to the measures which may most advantageously be taken, either by legislation, co-operative association, or otherwise, to secure the increase of their number."

The Committee was constituted as follows:—The Right Hon. the Earl of Onslow, G.C.M.G. (Chairman); the Right Hon. the Earl Carrington, G.C.M.G.; the Right Hon. Jesse Collings, M.P.; Sir Ralph Anstruther, Bart.; Major Patrick George Craigie, C.B. (an Assistant Secretary to the Board of Agriculture and Fisheries); Mr. Charles Bidwell; Mr. William Brown; Mr. (now Sir) Francis Allston Channing, M.P.; Mr. James Long; Mr. John William Willis-Bund; and Mr. Robert Armstrong Yerburgh, M.P. Mr. Thomas H. Sutton, of the Board of Agriculture and Fisheries, acted as Secretary. On the appointment of Lord Carrington as President of the Board, he resigned his position on the Committee, and appointed Mr. R. C. Munro Ferguson, M.P., in his place. The Committee examined fifty-eight witnesses, and also visited a number of existing small holdings in different parts of Great Britain.

The main Report is signed by all the members of the Committee, with the exception of Mr. Jesse Collings, M.P., though Sir Ralph Anstruther, Mr. James Long, and Mr. R. C. Munro Ferguson do so subject to certain reservations, while Sir Francis Allston Channing presents a supplementary report. Mr. Jesse Collings submits a separate report.

The recommendations made by the Committee in the main Report are divided into five heads, viz.:—(1) The direct pro-

* The Minutes of Evidence are published separately, Cd. 3278. Price 4s. 5d.

vision of small holdings by a Central Government Department; (2) the amendment of the Small Holdings Act, 1892; (3) advances to landowners for the equipment of small holdings; (4) agricultural education; and (5) agricultural co-operation. A summary of these recommendations is given below.

I. *Recommendation for Action by Central Authority.*—That in addition to the machinery provided by the Small Holdings Act, 1892, the provision of small holdings should be assisted by the direct intervention of a Central Government Department:—

(a) That with this view special Branches, for England and Scotland, of the Board of Agriculture and Fisheries be formed to make definite experiments in the creation of small holdings.

(b) That Parliament be invited to make an annual grant for the conduct of such operations.

(c) That in the event of the Board of Agriculture and Fisheries being unable to obtain by agreement land required for these operations, compulsory powers should be conferred on the Board.

(d) That the Board of Agriculture and Fisheries should make annually to Parliament a Return, showing the progress made in the provision of small holdings by Local Authorities, the extent of the difficulties or the measure of success experienced; and for this purpose the Board should have statutory power to procure from County Councils the necessary information on these points.

(e) That where the Board consider action is feasible they should take such steps as they deem advisable to secure suitable land, to properly set out, sub-divide, and equip it, either to let at an annual rent or to sell to suitable applicants, the purchase price to be repaid by such annual instalments, including interest and sinking fund, as will repay the total outlay over a prolonged period of years.

II. *Recommendations for Amendment of the Small Holdings Act, 1892.*—(a) That the purchaser shall pay down one-eighth instead of one-fifth of the purchase money.

(b) That after payment of the first instalment of purchase money the County Council shall have power to defer the payment of the instalments from time to time in such cases as they deem advisable.

(c) That the County Council may relax the condition prohibiting the erection of more than one dwelling-house on the holding, if in their opinion such relaxation will tend to develop the use of the holding for agricultural purposes.

(d) That in cases where the small holder has paid all the purchase money and wishes to use the holding for other than agricultural purposes, County Councils should have power to relax the necessity of the holding being offered for sale to the person then entitled to the lands of which the holding formed part, and then to the adjoining owner.

(e) That in the event of a small holding provided by the advance of public monies being required for public purposes, the occupying owner should for a limited period be entitled only to compensation for its value as a small holding.

(f) That power should be given to County Councils to acquire for small holdings purposes, grazing rights other than those attached to any land acquired by a Council for subdivision.

(g) That under the provisions of Part II. the proportion of the purchase money advanced may, if the County Council think fit, be increased from four-fifths to seven-eighths.

(h) That the title of the County Council should be registered with the Land Registry with a possessory title. That the scale of payments for all legal work should be fixed, and the work done by an officer of the County Council at the fees fixed.

(i) That an annual inquiry be made by each County Council Small Holdings Committee from the minor authorities within the county, as to what land is occupied by small holders, whether there is a demand for further land, and whether there is any land available.

(j) The Committee suggest that the attention of all County Councils should be called to the duty of their Small Holdings Committees to report as to why or why not the circumstances of the county would justify the Council putting into operation Part I. of the Act—the provision of small holdings; that petitions received under Section 5 (2) may be general and need not refer to specific lands; and that the inquiry ordered under the same section and sub-section need not be a public or local one.

III. *Recommendations as to Loans for Equipment of Small Holdings.*—That in addition to the experimental action of the Central Department in acquiring land and establishing small holdings in particular localities, State loans similar to those granted under the Public Money Drainage Act of 1846 should be made available, for the purpose of enabling landowners, under certain conditions, to undertake the necessary adaptation and equipment of voluntarily provided small holdings throughout the country.

That such advances should be granted at the lowest rate of interest possible without loss to the Treasury.

IV. *Recommendations as to Agricultural Education.*—(a) That further facilities should be provided for agricultural instruction in rural districts, and that for this purpose an addition should be made to the present grant to the Board of Agriculture and Fisheries.

(b) That part of any such additional grant shall be applied to the systematic training of those who are intending to cultivate the land in a small way, and to the provision of simple demonstration plots—designed to meet the particular wants of small cultivators—under the supervision of the collegiate institutions already provided.

(c) That in all rural and semi-rural elementary schools nature study and manual work—both based on rural needs—should, after the three R's, be made compulsory subjects of the curriculum, and that the system of school gardens should be encouraged as much as possible, and on practical lines.

(d) That children should be released from elementary day schools during the summer months for longer periods, and their attendance required in winter in further courses to a later age.

V. *Recommendations as to Agricultural Co-operation.*—(a) That practical steps be taken by Government to promote all forms of agricultural co-operation, and especially to encourage the formation of Agricultural Credit Societies by means of State loans, on the approved security of a Central Co-operative Agricultural Credit Association.

(b) That an annual grant be made to the Agricultural Organisation Society by the Board of Agriculture and Fisheries, under such limitations as the Board may think desirable.

The considerations on which these conclusions are based are discussed in detail in the Report, which also contains the views of the Committee on a number of less important points. Instances are given of successful small holdings and of some failures, and in speaking of the conditions which make for success, the Committee observe that it by no means follows that those who are asking for small holdings are always men who are capable of doing justice to them ; on the contrary, many of those who make these requests are known to be quite unfit : their judicious elimination would make those whose demands remain unsatisfied naturally less. Most of those who have made experiments in the sub-division of land for small holdings, and have made public their willingness to let or sell in small plots, have had considerable difficulty in sifting the applications, and have had to refuse a large number of manifestly unfit men, some of whom, having failed in every other walk of life, think that any man may make money out of land. It is against these that special precautions should be taken in any experiments made with public money or the public credit, and the Committee therefore desire specially to lay stress on the necessity for the selection of suitable men as occupiers of small holdings, but they are of opinion that these precautions could be effectively taken by Local Authorities, and by the Central Authority acting through local agencies.

The Committee gave much consideration to the question whether it is preferable that a small holder should be a tenant or should become a freeholder under a system of repayment of the capital value of his holding by instalments spread over a number of years. Upon this point there was much divergence of opinion among the witnesses. The Committee, however, conclude that the advantages of ownership have not, as a rule, been sufficiently forcibly put before those who desire to cultivate land, or the terms have been such that the additional cost of purchase has been more onerous than the small holder thinks he can afford, and that under any system such as that of the Irish Land Purchase Acts, whereby the interest and instalments of purchase-money together can be fixed at a sum not greater than would have to be paid in rent, a desire for ownership might be developed among the peasantry of England and

Scotland. To any such proposals, the chief objections which have been brought to the notice of the Committee are :—(1) That the “misery of mortgage” is sometimes more than a set-off to “the magic of property”; (2) that the houses of small freeholders are apt to fall into disrepair and into an insanitary condition, while the Local Authority either will not or cannot compel the owner to do that which would be insisted on in the case of a more wealthy proprietor; and (3) that the financial position of the small freeholder in the future may become more onerous than it would be were he to remain as a tenant.

The short reservation appended to the Report by Sir Ralph Anstruther refers to a suggestion that buildings erected on small holdings by County Councils or by the Central Authority should be exempt from the district bye-laws. Sir Ralph Anstruther does not concur in this conclusion.

Mr. Munro Ferguson, while approving of the main lines of the Report and agreeing with its chief recommendation—land purchase—emphasizes in his reservation the necessity for more definite action on some of the lines laid down by the Committee, and suggests some financial modifications. He considers that the recommendation of the Committee as to public loans to private owners involves the fatal admission that small holdings cannot pay.

Mr. James Long observes in his reservation that there are large numbers of persons, and among them agricultural labourers and other rural classes of humble position, who are unable to obtain possession of land on which they can dwell and which they can cultivate for the purpose of obtaining a whole or partial livelihood. Farm labourers would hail with satisfaction legislation which, as in Ireland, under the Irish Labourers Acts, would provide them with substantial and roomy cottages and an acre of land at rents within their narrow means, or at such a cost as would enable them to pay the instalments and interest with regularity. Mr. Long also refers to the arbitrary character of the building bye-laws of many Local Authorities.

Sir Francis Channing in his supplementary Report refers, in the first place, to the economic basis of small holdings, and observes that rural regeneration by State action to promote

small holdings is possible and desirable, but can only be made successful by putting the whole thing, the provision of land, the selection of the men, the methods of working, on a strictly economic basis.

He strongly emphasizes the importance of co-operation, and concludes that the very best and most effectual machinery for facilitating the creation of small holdings by voluntary action, for equipping them with the necessary houses and farm and other buildings, and for raising them when created to the highest degree of profitable efficiency, is by the agency of co-operation. To make small holdings a success, the State must do everything in its power to stimulate, encourage and popularize co-operative action and methods.

The third point to which Sir Francis Channing attaches special importance is agricultural education of a suitable type.

With regard to the provision of land, State action and State powers are considered to be imperatively necessary, as well as an extension of the powers of Local Authorities to acquire land.

Although Sir Francis Channing concurs in the proposal that there should be a Central Authority to provide and promote small holdings, he suggests that the proposal might be worked out with somewhat greater precision and caution, and states his views on certain points. He also favours a distinct Small Holdings Commission or Land Commission to undertake the duties of this central body, and adds an explanation of his views as to the granting of loans to landowners.

The separate Report presented by Mr. Jesse Collings refers chiefly with the proposal to grant State loans to landowners, a proposal with which Mr. Collings disagrees, on the ground that as tenants the small holders would not reap the fruits of their labour, as any increase in the value of the land would ultimately fall into the hands of the owners from whom they rent. Mr. Collings, therefore, makes the following recommendations :—

1. A substantial sum to be placed at the disposal of the Board of Agriculture for the purpose of creating small holdings throughout the country. The terms, as to loans to small holders, to be such as will secure that poverty be no bar to suitable men acquiring the ownership of the land they till.

2. The Act of 1892 to be amended so that the County Councils should be enabled to advance the whole of the purchase money.

3. That as Parliamentary grants are made to the Congested Districts (Scotland) Board 1897 for (among other purposes) the "creation of a body of small proprietors," so grants of a similar kind should be given to the local authorities in England for the equipment of small holdings. Such grants-in-aid to be apportioned among the County Councils according to the liabilities which the Councils themselves have undertaken under the Act of 1892.

THE FERTILISERS AND FEEDING STUFFS (GENERAL) REGULATIONS, 1906.*

The Board of Agriculture and Fisheries, in pursuance of the provisions of the Fertilisers and Feeding Stuffs Act, 1906, hereby make the following Regulations:—

Commencement.—1. These Regulations shall take effect on the 1st day of January, 1907, and remain in force until altered or revoked by the Board of Agriculture and Fisheries.

Definitions.—2. In these Regulations—

"The Act" means the Fertilisers and Feeding Stuffs Act, 1906.

"Purchaser" and "seller" include their respective agents.

"Fertiliser" means any article used for fertilising the soil.

"Feeding stuff" means any article used as food for cattle (as defined by the Act, *i.e.*, bulls, cows, oxen, heifers, calves, sheep, goats, swine, or horses) or poultry.

Other expressions have the same respective meanings as in the Act.

Forms of Certificate of Agricultural Analyst (s. 3 (4) (b)).—

3. The certificate of an Agricultural Analyst, in the case of a sample which has been divided into parts as in the Act provided, shall be in such one of the Forms A and B set forth in the schedule hereto as may be applicable to the case, with such variations as the circumstances require.

Analyst's Report.—4. Every Agricultural Analyst shall, as soon as may be after the 31st day of March, the 30th day of

* The Fertilisers and Feeding Stuffs Act, 1906, appeared in the *Journal*, Nov., 1906.

June, the 30th day of September, and the 31st day of December in each year, report to the Board of Agriculture and Fisheries the results of all analyses made by him under section 3 (4) (b) of the Act during the three calendar months ending on such dates respectively; and he shall also forthwith report to the said Board the result of any such analysis in any case in which any provision of the Act appears to him to have been infringed.

Citric Acid Solvent (s. 10 (1)).—5. When in an invoice relating to basic slag or basic superphosphate it is specified that a certain percentage of the phosphate contained in the basic slag or basic superphosphate is soluble in citric acid, this shall be taken to mean that it is capable of being dissolved to the extent of such percentage when 5 grams of the fertiliser and 500 cubic centimetres of water, containing 10 grams of citric acid, are continuously agitated in a flask or bottle of about 1 litre capacity for the period of half an hour at the ordinary temperature.

Revocation.—6. The Fertilisers and Feeding Stuffs Regulations, 1897, are hereby revoked as from the time at which these Regulations take effect.

Short Title.—7. These Regulations may be cited as the Fertilisers and Feeding Stuffs (General) Regulations, 1906.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their official seal, this twenty-seventh day of December, one thousand nine hundred and six.

L.S.

T. H. ELLIOTT,
Secretary.

THE SCHEDULE.

FORM A.

Certificate for Fertiliser.

I, the undersigned, Agricultural Analyst for the*, in pursuance of the provisions of the Fertilisers and Feeding Stuffs Act, 1906, hereby certify that I received on the day of 19, from † two parts of a sample of ‡ for analysis; which parts were duly sealed and fastened up and marked §, and were accompanied by the annexed || (copy of an) invoice, and also by the annexed || circular and advertisement, and that at the request of ¶, I have analysed one of the said parts and declare the result of my analysis to be as follows:—

I am of opinion that the said part contained the following percentages:—

** Nitrogen	...	...	...	...	per cent.
†† Phosphates	{ Soluble Insoluble	...	...	...	„
‡‡ Potash		...	...	...	„
§§		„

As witness my hand this

day of , 19
[Name and Address of Analyst.]

* Here insert the name of the county, borough, or district.

† Here insert the name of the person delivering the sample, and if so "by post."

‡ Here insert the name of the article as stated on the invoice.

§ Here insert the distinguishing mark on the sample.

|| The invoice or copy invoice, and any circular or advertisement given to the Analyst, will be initiated by the Analyst for purposes of identification and annexed to this certificate.

¶ Here insert name of the person requesting the analysis.

** The Analyst may, in his discretion, add a statement of the amount of ammonia to which the amount of nitrogen stated in the certificate is equivalent.

†† The phosphates in both cases to be given in terms of tribasic phosphate of lime, and in accordance with the definitions of "soluble" and "insoluble" contained in s. 10 (1) of the Act.

‡‡ The potash to be given in terms of potassium oxide, K_2O .

§§ Here state:—

(a) The percentages of chemical and other ingredients present, when any statement of such percentages is contained in the invoice, or in any accompanying circular or advertisement descriptive of the article.

(b) In what respect, if any, the invoice or the description of the article contained in any such circular or advertisement, is false in any material particular to the prejudice of the purchaser.

FORM B.

Certificate for Feeding Stuff.

I, the undersigned, Agricultural Analyst for the * , in pursuance of the provisions of the Fertilisers and Feeding Stuffs Act, 1906, hereby certify that I received on the day of 19 , from † two parts of a sample of ‡

for analysis, which parts were duly sealed and fastened up and marked § , and were accompanied by the annexed || (copy of an) invoice, and also by the annexed || circular and advertisement, and that at the request of ¶ , I have analysed one

of the said parts, and declare the result of my analysis to be as follows:—

I am of opinion that the said part contained the following percentages:—

Oil per cent.

Albuminoids ,

**

and that ††

As witness my hand this day of 19 .
[Name and Address of Analyst.]

* Here insert name of county, borough, or district.

† Here insert name of person delivering sample, and if so "by post."

‡ Here insert the name of article as stated on the invoice.

§ Here insert the distinguishing mark on the sample.

|| The invoice, or copy invoice, and any circular or advertisement given to the Analyst, will be initiated by the Analyst for purposes of identification and annexed to this certificate.

¶ Here insert name of the person requesting the analysis.

** The percentages of nutritive and other ingredients present, when any statement of such percentages is contained in the invoice, or in any accompanying circular or advertisement descriptive of the article.

†† Here state, as the case may be:—

(a) Whether the composition of the article agrees with the statements contained in the invoice, and with the name or description under which the article is sold, so far as the same implies that it is prepared from one particular substance or seed only, or from two or more particular substances or seeds only; and, if not, in what respect.

(b) In what respect, if any, the invoice or the description of the article contained in any such circular or advertisement, is false in any material particular to the prejudice of the purchaser.

(c) Whether the article is suitable for feeding purposes for cattle (as defined by the Act), or for poultry, as the case may be; and, if not, in what respect.

(d) Whether the article contains any ingredient deleterious to cattle (as defined by the Act) or to poultry, as the case may be, or any ingredient worthless for feeding purposes and not disclosed in the invoice; and, if so, whether, in either case, to an extent materially prejudicial to the purchaser.

- (e) Where separate samples are taken of the portion of a feeding stuff which is mouldy, sour, or otherwise unsuitable for feeding purposes, and also of the residue of the feeding stuff, state the estimated proportion of the unsuitable feeding stuff in the certificate relating to the unsuitable portion.

THE FERTILISERS AND FEEDING STUFFS (SAMPLING, &c.) REGULATIONS, 1906.

The Board of Agriculture and Fisheries, in pursuance of the provisions of the Fertilisers and Feeding Stuffs Act, 1906, hereby make the following Regulations:—

Commencement.—1. These Regulations shall take effect on the 1st day of January, 1907, and remain in force until altered or revoked by the Board of Agriculture and Fisheries.

Definitions.—2. In these Regulations:—

“The Act” means the Fertilisers and Feeding Stuffs Act, 1906.

“Purchaser” and “seller” include their respective agents.

“Fertiliser” means any article used for fertilising the soil.

“Feeding stuff” means any article used as food for cattle, (as defined by the Act, *i.e.*, bulls, cows, oxen, heifers, calves, sheep, goats, swine, or horses) or poultry.

Other expressions have the same respective meanings as in the Act.

Appointment of Agent.—3. The purchaser of a fertiliser or feeding stuff may, for the purposes of the Act, appoint an agent, in the form set forth in the schedule hereto, or in a form to the like effect.

Invoice, &c, to be sent to Analyst.—4. Where a sample is, or parts of a sample are, under Section 3 of the Act, sent for analysis to the Chief Analyst or to an Agricultural Analyst, there shall be sent with the sample or parts the invoice (if any) relating to the article from which the sample was taken, or a copy of the invoice or of such part thereof as is hereinafter prescribed, and also any circular or advertisement, or a copy thereof, of the seller descriptive of such article which the purchaser may wish the Analyst to consider in making his analysis and giving his certificate.

Prescribed Part of Invoice (s. 3 (7)).—5. Where a copy of an

invoice is sent to the Chief Analyst or to an Agricultural Analyst in pursuance of the Act, there may be omitted from such copy the name and address of, and any other matter which would identify or disclose, the seller of the article to which the invoice relates. The prescribed part of the invoice shall be the whole thereof except such name, address, and other matter as aforesaid.

Sampling.—6. Where, for the purposes of the Act, a sample is required to be taken in the prescribed manner, or in accordance with regulations made under the Act, the following provisions shall apply:—

(a) The person taking the sample shall give to the seller at least three days' notice in writing of his intention to take the sample, with particulars as to the place, day, and hour of sampling. If the seller does not attend, the sample shall be taken in the presence of a witness.

(b) The sample shall be taken in the following manner:—

In the Case of a Fertiliser—

(i.) When the fertiliser is delivered in bags or other packages, a number of bags or packages shall be selected as follows, viz.:—

Not less than 2 bags or packages where the quantity of the whole consignment does not exceed 1 ton.

Not less than 3 bags or packages where the quantity of the whole consignment exceeds 1 ton and does not exceed 2 tons.

Not less than 4 bags or packages where the quantity of the whole consignment exceeds 2 tons and does not exceed 3 tons;

and, where the quantity exceeds 3 tons, one additional bag or package for every additional ton or part of a ton; provided that in no case need more than 10 bags or packages be selected. The selection shall be made from different parts of the whole consignment.

(ii.) The selected bags or packages shall be emptied separately on a clean and dry floor, worked up with a spade, and one spadeful from each set aside. The spadefuls so set aside shall then be thoroughly mixed together and any lumps broken up by the hand or

- spade. From this mixture a sample, from about 2 lb. to 4 lb. in weight, shall be taken.
- (iii.) When the fertiliser is delivered in bulk, a like number of portions, according to the quantity of the whole consignment, shall be taken from different parts of the whole consignment and thoroughly mixed together on a clean and dry floor, and a sample, from about 2 lb. to 4 lb. in weight, shall be taken from the mixture.
- (iv.) When the fertiliser consists of bulky material, uneven in character and likely to get matted together, such as shoddy, wool refuse, hair, &c., portions are to be taken from the selected bags or packages, or from different parts of the fertiliser if in bulk, the matted portions torn up, and all the portions thoroughly mixed together. The sample shall be taken from the mixture and shall be not less than 3 lb. in weight.
- (v.) As an alternative method, where neither the seller nor the buyer signifies objection thereto, the sample of a fertiliser delivered in bags or other packages may be taken by a sampling pale or spear or pipe or tube, which shall not be less than twenty-four inches in length, and two inches in diameter. The sampling instrument shall be pressed into the mouth of the bag or package so as to pass through the entire depth of the contents or to the extreme length of the sampling instrument. The several quantities thus taken from the selected bags or packages, which shall be at least double the number of bags or packages required to be selected under paragraph (i), shall be thoroughly mixed together and a sample, from about 2 lb. to 4 lb. in weight, shall be taken from the mixture.

In the Case of a Feeding Stuff—

- (vi.) When the feeding stuff is in the state of grain or meal, it shall be sampled in the same manner as prescribed for fertilisers. When the feeding stuff is in the state of cake, a number of cakes shall be selected, from different parts of the whole consignment, as follows :—
Not less than 5 cakes where the quantity of the consignment does not exceed 2 tons.

Not less than 10 cakes where the quantity exceeds 2 tons and does not exceed 5 tons.

Not less than 15 cakes where the quantity exceeds 5 tons and does not exceed 50 tons.

Not less than 25 cakes where the quantity exceeds 50 tons.

(vii.) The selected cakes shall either be passed through a cake-breaker or be broken into small pieces such as could be passed through a $1\frac{1}{2}$ -inch sieve. The broken cakes or the pieces shall be thoroughly mixed, and from the mixture a sample, not less than 6 lb. in weight, shall be taken.

(viii.) As an alternative method, three strips shall be taken across the middle of each selected cake; and each of the three parts, into which (under Regulation 7) a sample is to be divided, shall contain one strip of each selected cake.

(ix.) Where, on delivery of the consignment, any appreciable portion of the feeding stuff is found to be mouldy, sour, or otherwise unsuitable for feeding purposes, separate samples are to be taken of the unsuitable portion and of the residue of the feeding stuff respectively; and, in the case of unsuitable cakes, the sample may consist of several large pieces fairly representative thereof. An estimate shall be made by the person taking the sample as to the proportion of the feeding stuff unsuitable for feeding purposes, and shall be communicated in writing by him to the Analyst.

(x.) When the feeding stuff is in a fluid or semi-fluid condition, three packages shall be selected, and, after the contents have been well stirred or shaken, a portion shall immediately be taken from each. The several portions shall then be thoroughly mixed together in a clean vessel, and from the mixture a sample, from about 2 lb. to 4 lb. in weight, shall be taken.

In the Case of both Fertilisers and Feeding Stuffs—

(xi.) Where the quantity of the whole consignment does not exceed 2 cwt., the sample may consist of such a portion of the consignment as is fairly representative

of the whole, and the sample shall be of such a quantity that each of the parts, into which (under Regulation 7) it is to be divided, will be sufficient to enable a proper analysis to be made thereof.

(c.) *General Directions as to Sampling*—

(xii.) In every case the sampling shall be done as quickly as is possible consistently with due care, and the material shall not be allowed to be exposed any longer than is absolutely necessary.

(xiii.) Each of the parts, into which (under Regulation 7) the sample is to be divided, shall be packed in a dry clean bottle, or jar, or (except in the case of a fertiliser) in a dry clean tin, or in some other suitable manner, so that the original composition of the fertiliser or feeding stuff may be preserved.

(xiv.) Each of the said parts of the sample shall be so packed and secured that it cannot be tampered with, and shall be sealed and initialed by the person taking the sample. It may also be sealed by the purchaser and the seller, if present and so desiring. If the seller does not attend, the witness shall initial it. It shall be marked with the name of the article, the date and the place of the sampling, and with some distinguishing number, in such a manner that the particulars so marked can be seen without breaking the seal or seals.

(xv.) Where a sample is taken in the presence of, and sealed by, the seller as well as the purchaser, it shall be deemed, as between the purchaser and the seller, to have been taken in accordance with these Regulations.

Division of Sample, &c.—7. Where a sample has been taken, under Section 3 of the Act, with a view to the institution of any civil or criminal proceeding, the person taking the sample shall divide it into three parts, as nearly as possible equal, and shall cause each part to be marked, sealed, and fastened up, and shall forthwith deliver or send by post two parts to the Agricultural Analyst and one part to the seller.

Short Title.—8. These Regulations may be cited as the Fertilisers and Feeding Stuffs (Sampling, &c.) Regulations, 1906.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their official seal, this twenty-seventh day of December, one thousand nine hundred and six.

L.S.

T. H. ELLIOTT,
Secretary.

THE SCHEDULE.

FORM.

Appointment by Purchaser of Agent for the purposes of the Fertilisers and Feeding Stuffs Act, 1906.

I, A.B., of _____ hereby appoint C.D., of _____ Association
or the Secretary for the time being of the _____
[or as the case may be] to do on my behalf all things necessary for the purpose of
obtaining an analysis under the Fertilisers and Feeding Stuffs Act, 1906, of the fer-
tiliser or feeding stuff bought by me under an invoice, a copy of which is annexed.

THE FERTILISERS AND FEEDING STUFFS (LIMITS OF ERROR) REGULATIONS, 1906.

The Board of Agriculture and Fisheries, in pursuance of the provisions of the Fertilisers and Feeding Stuffs Act, 1906 hereby make the following Regulations:—

Commencement.—1. These Regulations shall take effect on the 1st day of January, 1907, and remain in force until altered or revoked by the Board of Agriculture and Fisheries.

Definitions.—2. In these Regulations—

“The Act” means the Fertilisers and Feeding Stuffs Acts, 1906.

“Purchaser” and “seller” include their respective agents.

“Fertiliser” means any article sold for use as a fertiliser of the soil, which has been subjected to any artificial process in the United Kingdom or imported from abroad.

“Feeding stuff” means any article sold for use as food for cattle (as defined by the Act, *i.e.*, bulls, cows, oxen, heifers, calves, sheep, goats, swine, or horses) or poultry, which has been artificially prepared otherwise than by being mixed, broken, ground, or chopped.

Other expressions have the same respective meanings as in the Act.

Limits of Error.—3. For the purposes of the provisions of Section 1 of the Act, concerning the effect, as a warranty, of the

statements made in the invoice of a fertiliser or of a feeding stuff (as above defined in Regulation 2) respecting the percentages of nitrogen, phosphates, and potash contained in the fertiliser, or of oil and albuminoids contained in the feeding stuff, the limits of error shall be as set forth in the Schedules hereto.

Short Title.—4. These Regulations may be cited as the Fertilisers and Feeding Stuffs (Limits of Error) Regulations, 1906.

In witness whereof the Board of Agriculture and Fisheries have hereunto set their official seal, this twenty-seventh day of December, one thousand nine hundred and six.

L.S.

T. H. ELLIOTT,

Secretary.

First Schedule.

FERTILISERS.

Note.—In this Schedule the figures relating to Limits of Error represent percentages of the whole bulk.

Example of Application of Schedule.—*e.g.* In the case of a Bone Compound, if the percentages stated in the invoice are, soluble phosphates, 20; insoluble phosphates, 8; nitrogen, 1; then the warranty implied under s. 1 (1) of the Act will be that the fertiliser contains:—soluble phosphates, 19 to 21 per cent.; insoluble phosphates, 7 to 9 per cent.; nitrogen, 7 to 1·3 per cent.

Description of Fertiliser.	Limits of Error.			
	Soluble Phosphates.	Insoluble Phosphates.	Nitrogen.	Potash.
1. Superphosphate	1	—	—	—
2. Dissolved Bones (Vitriolized or Vitriolated) made from Raw Bones and Acid only:—				
(I.) When the total of the percentages of Phosphates (soluble and insoluble) stated in the invoice amounts to 32 or more, then—				
(a) If the excess of the actual percentage of insoluble Phosphates over that stated in the invoice is 3 or more ...	4	—	·3	—
(b) If such excess is not less than 2, but is less than 3	3	—	·3	—
(c) If such excess is not less than 1, but is less than 2	2	—	·3	—
(II.) In all other cases ...	1	1	·3	—

Description of Fertiliser.	Limits of Error.			
	Soluble Phos-phates.	Insoluble Phos-phates.	Nitrogen.	Potash.
3. Bone Compounds	1	1	'3	—
4. Compound Manures (other than Bone Compounds, but including Dissolved or Equalised Guano):—				
(a) If the respective percentages of Nitrogen and Potash stated in the invoice do not exceed 4	1	1	'3	'3
(b) If such respective percentages exceed 4	1	1	'5	'5
5. Sulphate of Ammonia	—	—	'5	—
6. Nitrate of Soda	—	—	'5	—
7. Ground Hoofs and Horns	—	—	'5	—
8. Dried Blood	—	—	'5	—
9. Fish Guano and Meat Meal	—	2	'5	—
10. All Cakes and Meals (other than Bone or Meat Meal)... ..	—	—	'5	—
11. Ground Bones and Bone Meal	—	2	'5	—
12. Basic Slag and Basic Super-phosphate	2*	2	—	—
13. Shoddy, Wool, and Hair Waste	—	—	1	—
14. Kainit and other Potash Salts:—				
(a) Where the percentage of Potash stated in the invoice does not exceed 15	—	—	—	1
(b) Where such percentage exceeds 15	—	—	—	2
15. Nitrate of Potash	—	—	'5	2
16. Peruvian and other, natural Imported Guanos:—				
(a) Where the percentage of insoluble Phosphate stated in the invoice does not exceed 30	—	3	—	'5
(b) Where such percentage of insoluble Phosphate exceeds 30	—	5	—	'5
(c) Where the percentage of Nitrogen stated in the invoice does not exceed 3	—	—	'5	'5
(d) Where such percentage of Nitrogen exceeds 3 and does not exceed 5	—	—	'75	'5
(e) Where such percentage of Nitrogen exceeds 5	—	—	1	'5

* That is, soluble in a solution of Citric Acid of the prescribed strength.

Second Schedule.

FEEDING STUFFS.

Note.—In this Schedule the percentage of albuminoids is to be taken as the percentage of nitrogen multiplied by 6·25.

Example of Application of Schedule.—e.g. In the case of a linseed cake, if the percentages stated in the invoice are, oil, 10; albuminoids, 30; then the warranty implied under s. 1 (2) of the Act will be that the linseed cake contains :—oil, 8·75 to 11·25 per cent. ; albuminoids, 26·25 to 33·75 per cent.

Description of Feeding Stuff.	Limits of Error.
Decorticated Cotton Cake or Meal ...	{ One-tenth of the percentage of oil and one-tenth of the percentage of albuminoids stated in the invoice.
Uncorticated Cotton Cake or Meal	
Earth Nut or Ground Nut Cake or Meal	
Palm Kernel or Palm Nut Cake or Meal	
Cocoanut Cake or Meal	
Niger Seed Cake or Meal	
Sesame Seed Cake or Meal	
Sunflower Seed Cake or Meal	
Hemp Seed Cake or Meal	
Kurdee or Safflower Cake or Meal ...	
Compound Cakes and Meals... ..	{ One-eighth of the percentage of oil and one-eighth of the percentage of albuminoids stated in the invoice.
Linseed Cake or Meal... ..	
Rape Cake or Meal	
Maize Products	
All other feeding stuffs (as above defined in Regulation 2) not otherwise specified in this Schedule ...	{ One-fifth of the percentage of oil and one-fifth of the percentage of albuminoids stated in the invoice.

IMPORTS OF AGRICULTURAL PRODUCE IN 1906.

The following tables, which have been compiled from the Trade and Navigation Accounts, show the quantities and value of the principal articles of agricultural produce imported into the United Kingdom during the past year.

Live cattle were imported in 1906 in about the same numbers as in 1905, the United States and Canada being the two sources of supply. There was, however, a marked increase in the receipts of fresh beef, which were again larger than in any preceding year, the imports of this class of food being half-a-million cwt. more than those of 1905 and nearly 1,200,000 cwt. more than the average of the five years 1901-1905. The distinguishing feature in this trade has been the rapid strides made during the last few years by Argentina, which now sends more refrigerated meat to these shores than the United States, though the latter country still holds its position as a purveyor for the better class trade. The quantity supplied by Argentina was 2,796,000 cwt., as against 2,580,000 cwt. in 1905, having an aver-

age value of 29s. 7d. per cwt., while the receipts from the United States in 1906 were 2,427,000 cwt., with an average value of 43s. 2d. per cwt. The Argentine trade may be said to have grown up since about 1898, when only 108,000 cwt. were exported to this country.

The total imports of fresh beef amounted to 5,529,000 cwt., while the total weight of beef represented by the imports of cattle may be estimated at 3,646,000 cwt., so that the total receipts of meat of this class from abroad in 1906 was 9,175,000 cwt., or about $23\frac{1}{2}$ lb. per head of the population. In 1905 the figures were 8,716,000 cwt., representing $22\frac{1}{2}$ lb. per head. The declared value of the fresh beef imported was 35s. 5d. per cwt., the same figure as in 1905. Live cattle averaged £17 6s. 10d. per head, as against £17 2s. 1d. per head in 1905.

Imports of Live and Dead Meat.

Description.	Quantities.		Values.	
	1905.	1906.	1905.	1906.
	No.	No.	£	£
Cattle	565,139	561,215	9,665,806	9,732,180
Sheep	183,084	103,359	278,753	156,947
Swine	150	—	300	—
Total Live Animals...	—	—	9,944,859	9,889,127
	Cwt.	Cwt.		
Beef, Fresh	5,037,521	5,529,129	8,931,593	9,793,670
„ Salted	142,806	161,363	202,307	217,947
Mutton, Fresh	3,811,069	4,088,689	7,336,490	7,655,543
Pork, Fresh	505,633	492,171	1,162,370	1,130,950
„ Salted	205,965	206,056	252,606	266,800
Bacon	5,498,960	5,542,622	12,774,855	14,644,095
Hams	1,318,302	1,302,751	3,118,372	3,491,594
Meat, Unenumerated, Salted or Fresh	670,144	652,363	1,225,692	1,145,466
Meat, Preserved	833,029	487,422	2,647,195	1,822,671
Rabbits (dead)	656,078	803,556	835,929	1,000,786
Total Dead Meat	18,679,507	19,266,122	38,487,409	41,169,522

In the case of sheep there has been recently a marked decrease in the imports, the number falling from 382,000 in 1904 to 183,000 in 1905, and still further in 1906 to 103,000, this being the lowest figure since 1892-93, when there was a similar sudden diminution in supplies. The trade in fresh mutton, however, was more than maintained, and the imports, as in the case of beef,

reached a figure which had not previously been exceeded. New Zealand and Argentina, which are the principal competing countries, sent respectively 1,748,000 cwt. and 1,433,000 cwt., while the Australian Commonwealth contributed 617,000 cwt. The declared value of the sheep was 30s. 4d., only 1d. less than in the preceding year, while fresh mutton averaged 37s. 5d. per cwt., compared with 38s. 6d. in 1905.

The imports of bacon have been increasing annually since 1902, though they are still substantially below the figures of the four years 1898-1901. In point of value the amount of £14,644,000 reached last year was the highest ever recorded for this article of food. Somewhat larger consignments were received from the United States, but the receipts from Denmark and Canada showed little change. A distinct rise is noticeable in values from 46s. 6d. per cwt. in 1905 to 52s. 10d. per cwt. in 1906, and a comparison of the values for the different countries shows that Danish bacon averaged 59s. 1d., American 49s. 5d., and Canadian 52s. 8d. per cwt.

The imports of rabbits have been rising rapidly of late, and amounted to 803,500 cwt. in 1906, valued at £1,001,000, figures which may be compared with 392,000 cwt. imported in 1901, valued at £649,000. The whole of the growth is due to larger consignments from Australia, which contributed 645,000 cwt. The imports from Belgium appear to be declining.

Converting the live animals into their equivalent weight of meat and adding the total imports of dead meat of all kinds, it appears that this country consumed, in addition to the home supply, some 22,968,500 cwt., compared with 22,457,600 cwt. in 1905. The total value credited to the different kinds of live and dead meat was £51,058,600.

The imports of dairy produce were generally larger than in 1905. Butter in particular showed a decided rise, which brought the total both in quantity and value above that of any preceding year. The receipts of Russian or Siberian butter, which have been steadily increasing for several years, amounted to 606,500 cwt., compared with 461,100 cwt. last year. Sweden, Holland, and France again sent smaller consignments, but there was a slight increase in the amount of Danish butter (1,675,700 cwt.). The Colonies of Victoria, New South Wales, Queensland, and

New Zealand sent 857,500 cwt., as against 750,700 in 1905, but the amount credited to Canada declined from 292,100 cwt. to 192,100 cwt. The average value of imported butter was 108s. 2d. per cwt., being 4s. above the declared value in 1905, and 8s. 7d. above that of 1904.

Imports of Dairy Produce, Margarine, and Eggs.

Description.	Quantities.		Values.	
	1905.	1906.	1905.	1906.
	Cwt.	Cwt.	£	£
Butter	4,147,864	4,338,383	21,585,622	23,466,252
Margarine	1,088,259	1,101,962	2,735,736	2,733,795
Cheese	2,442,660	2,638,776	6,339,742	7,607,641
Milk, Condensed ...	893,634	908,019	1,584,363	1,563,708
Eggs	18,814,261	18,874,109	6,812,476	7,098,137

Although Canada did not maintain her position in the butter trade, she sent a larger quantity of cheese to this country than in 1905, and in this commodity also a recovery in price has to be noted from 45s. 9d. per cwt. in 1904 to 51s. 11d. in 1905, and further to 57s. 8d. in 1906.

In the egg import trade the changes during the year were not very marked. Russia sent 7,133,000 great hundreds and Denmark 3,824,000 great hundreds, quantities which were in each case rather less than the figures for last year. The average value of the eggs from all countries was 7s. 6¼d. per great hundred, as against 7s. 3d. in 1905.

Imports of Horses, Poultry, and Miscellaneous Animal Products.

Description.	Quantities.		Values.	
	1905.	1906.	1905.	1906.
			£	£
Horses No.	13,711	17,848	354,030	535,532
Poultry and Game ...	—	—	699,480	985,457
Lard cwt.	2,012,305	2,049,367	3,692,573	4,361,399
Tallow and Stearine ..	1,822,819	1,933,837	2,369,386	2,795,815
Wool, Sheep, Lambs lb.	615,708,827	639,553,059	23,821,825	27,154,486
Sheepskins, undressed No.	17,531,076	19,942,274	1,936,273	2,446,677
Hides* cwt.	508,475	533,321	1,322,890	1,493,009

* Does not include dry hides.

The decline in the imports of horses which has been going on since 1900, when 51,786 were received, was checked last year, the numbers being 17,848, as against 13,711 in 1905.

The value of the poultry (alive or dead) received in 1906 was £869,000, compared with £906,000 in 1905; Russia's share in this trade declined from £275,000 to £186,000, and the first place was taken by the United States, which increased her exports to this country from £152,000 to £244,000.

The imports of sheep and lambs' wool, which had been declining from 1901 to 1904, rose in 1905 and again in 1906. Out of a total of 639,553,000 lb. Australia sent 250,279,000 lb., compared with 253,373,000 lb. last year, and New Zealand sent 146,760,000 lb., as against 139,269,000 lb. in 1905. The receipts from Russia, France, Argentina, South America (West Coast), and India were all larger than in 1905.

The re-exports of foreign wool diminished to some extent, so that the balance of foreign wool remaining for manufacture in this country was 373,418,000 lb., as against 338,606,211 lb. in 1905.

The average value of the imports of wool was 10¼d. per lb., as compared with 9¼d. in 1905, 8¾d. in 1904, 8¼d. in 1903, and 7½d. in 1902.

Imports of Grain and Flour.

Description.	Quantities.		Values.	
	1905.	1906.	1905.	1906.
	Cwt.	Cwt.	£	£
Wheat	97,622,752	92,967,200	35,279,928	32,676,185
Wheat Meal and Flour	11,954,763	14,190,300	6,044,845	6,817,213
Barley	21,426,900	19,934,500	6,017,350	5,677,587
Oats	17,095,463	15,286,500	4,713,265	4,532,160
Oatmeal	633,199	661,809	463,293	495,980
Maize	42,101,210	48,685,200	11,034,748	11,972,686
Maize Meal	459,188	616,200	144,829	195,302
Peas	2,015,876	1,453,420	725,104	614,649
Beans	1,225,050	634,280	414,227	231,758
Other Corn and Meal ...	1,712,487	1,746,352	581,468	609,560
Total	—	—	65,419,057	63,823,080

During the past twelve months the leading sources of our wheat supply have been the United States (22,491,000 cwt.), Argentina (19,176,000 cwt.), Russia (15,017,000 cwt.), India

(12,636,000 cwt.), Canada (11,310,000 cwt.), and Australasia (7,864,000 cwt.). The United States, which in 1905 only sent 6,635,000 cwt., has, it will be seen, recovered its former position as the principal source of our wheat supply, the imports from Russia, Argentina, and India having all diminished. The decline in the importation of American flour, which was a noticeable feature of the trade in 1905, has been checked, the receipts from this source being 9,810,000 cwt., compared with 5,685,000 cwt. in 1905, 8,253,000 cwt. in 1904, and 16,224,000 cwt. in 1903.

The average declared value of wheat was 7s. per cwt., and of flour 9s. 7d. per cwt.

Miscellaneous Imports.

Description.	Quantities.		Values.	
	1905.	1906.	1905.	1906.
Onions bush.	7,587,025	8,310,534	£ 1,094,802	£ 953,615
Potatoes... .. cwt.	3,664,294	3,816,373	1,404,607	1,332,027
Tomatoes "	1,137,193	1,124,472	970,579	953,191
Vegetables, unenumerated cwt.	—	—	419,752	404,870
Apples "	3,494,650	2,808,732	2,065,193	1,753,577
Pears "	417,919	576,220	407,817	571,722
Plums "	480,211	891,513	524,673	759,082
Cherries... .. "	186,682	190,872	253,042	246,383
Strawberries "	29,399	52,251	40,120	64,799
Currants "	82,286	106,795	94,408	139,794
Gooseberries "	17,159	39,374	11,941	22,921
Hops "	108,953	232,619	456,280	852,476
Flax "	1,801,960	1,747,300	3,581,808	3,558,567
Clover and Grass Seeds... .. cwt.	316,111	300,939	651,576	615,920
Wood and Timber (except Furniture Woods, Hardwoods, and Veneers) loads	8,962,259	10,079,087	21,282,227	25,580,239
Oilseeds—Cotton tons	568,928	624,767	2,973,520	3,716,567
„ Flax or Linseed qrs.	1,924,008	1,588,100	3,541,333	3,274,988
„ Rape "	81,326	118,149	286,073	234,639
Oilseed Cake tons	357,577	360,188	2,205,165	2,362,471
Manures... .. "	601,993	618,969	2,069,537	2,184,123
Flowers, fresh "	—	—	202,217	233,884

Owing to smaller receipts from Russia the imports both of barley and oats declined. Maize, on the other hand, reached a higher total than in the two preceding years, Argentina sending us the largest contribution (24,524,000 cwt.), the United States taking the second place with 18,618,000 cwt.

With regard to the imports of fruit the receipts of apples were only 2,809,000 cwt., compared with 3,495,000 cwt. in 1905. Cherries, currants, gooseberries, strawberries, pears, and plums, were, however, all imported in increased quantities.

Some indication of the range of prices in 1906 as compared with 1905 may be gathered from the average declared value of several of the different articles. Cattle, bacon, hams, butter, eggs, cheese, and wool all show a rise, while grain generally exhibits but little fluctuation. The figures for some of the principal articles are as follows:—

						1905.			1905.		
						£	s.	d.	£	s.	d.
Cattle	...	...	...	...	...	17	2	1	17	6	10
Sheep	...	...	...	...	per head	1	10	5	1	10	4
Beef, fresh	...	...	...	...	per cwt.	1	15	5	1	15	5
Mutton, fresh	...	...	...	...	"	1	18	6	1	17	5
Pork,	"	...	...	...	"	2	6	0	2	5	11
Bacon	...	...	...	...	"	2	6	6	2	12	6
Hams	...	...	...	...	"		
Butter	...	...	...	...	"	5	4	2	5	8	2
Cheese	...	...	...	...	"	2	11	11	2	17	8
Eggs	...	...	...	...	per great hundred	0	7	3	0	7	6½
Wool	...	...	...	...	per lb.	0	0	9½	0	0	10½
Wheat	...	...	...	...	per cwt.	0	7	3	0	7	0
" flour	...	...	...	...	"	0	10	1	0	9	7
Barley	...	...	...	...	"	0	5	7	0	5	8
Oats	...	...	...	...	"	0	5	6	0	5	11
Maize	...	...	...	...	"	0	5	3	0	4	11

Some experiments have been carried out by the Agricultural Department of the Lancashire County Council for the purpose of comparing the relative advantages of cob lime (that is quick or burnt lime), ground lime, and ground limestone when applied to meadow land. Ground lime is merely the burnt lime reduced to a fine powder, and both these materials when exposed to the air become changed into carbonate of lime, while ground limestone is limestone rock—that is, carbonate of lime—ground to a fine powder, and if it were found equally effective, the expensive process of burning the rock would be dispensed with.

Use of Different Forms of Lime.

An important consideration in comparing cob lime and ground lime with ground limestone is the relative prices per ton. The cob lime and ground lime used in these experiments cost, delivered at the railway station, 13s. and 20s. 3d. per ton respectively. The cost of the ground limestone, however, was only 6s. 6d. per ton delivered at the same railway station ; but as $1\frac{3}{4}$ tons were used in order to supply the same weight of lime per statute acre as was applied in the 1 ton of cob lime or ground lime, this raised the cost of the ground limestone dressing to 11s. 4d. per statute acre. The use of the additional $\frac{3}{4}$ ton of ground limestone entails extra carting, but it should be pointed out also that the ground limestone, being delivered in bags, is much easier to handle and involves less labour in its application than does cob lime. As compared with ground lime, the ground limestone has not the same irritating effect upon the eyes and nose, and drops more readily from a slag-sower in breezy weather. The ground limestone also sinks very readily into the soil.

The results of the experiments at the County Council Farm in the two years 1905-6, showed that, taking into account the price per ton, ground limestone can be employed economically upon meadow land where a dressing of lime is needed.

According to the results obtained at various farms in the county, the more finely divided forms of lime are more immediately effective than cob lime. The results indicate also that ground limestone is a more profitable dressing than either ground lime or cob lime.

In districts where, owing to nearness of lime-kilns, it is more convenient to use cob lime, it is essential that the lime be spread from the heaps as soon as fallen. In order to ensure more effective distribution, a light harrowing should be given about two or three days afterwards, so as to scatter any lumps that may not have fallen in the heaps.

Ground lime should not be delivered at the farm until all arrangements have been made for its application, as loss will be occasioned by the bursting of the bags. The ground lime should be finely ground so that not less than 35 per cent. would pass through a sieve with 10,000 holes to the square inch, and should contain about 90 per cent. of lime.

Ground limestone should contain a rather larger percentage of fine powder, as the finer the grinding the greater will be its activity in the soil. It should also contain a high percentage of carbonate of lime. When the purer limestones are used for the preparation of ground limestone, the percentage of carbonate of lime may be expected to exceed 95 per cent.

Since November, 1905, various experiments have been carried out with Insecticides by Mr. W. E. Collinge, of the Department of Economic Zoology, of the University of Birmingham, and amongst these was one undertaken for the purpose of finding a more effective winter spray-fluid for destroying the eggs of the Mussel Scale, Plum Aphis, and Apple Sucker, three well-known insect pests in the Midland Counties, which annually cause serious losses to fruit-growers.

The Winter Spraying of Fruit Trees.

In connection with these experiments, it was found in spraying the eggs of the Apple Sucker with soda and potash that whilst it sometimes happens that the eggs are not all killed, all the experiments go to prove that if the spray-fluid is properly made and applied, and does not contain too much soft soap, comparatively very few of the eggs hatch out. It seemed desirable to institute trials with a view to obtaining a more effective spray-fluid, and experiments were first made with caustic soda and soft soap, but these proved unsatisfactory. A number of laboratory experiments were next made with various strengths of caustic soda, mixed with varying quantities of paraffin emulsion. Nearly all of these pointed to the fact that a strong solution of caustic soda and paraffin emulsion was effective, and the percentage of eggs killed rose with the strength of the spray-fluid up to a certain point.

Out-of-door experiments were then commenced in March, 1906, with the following spray-fluid :—

Caustic soda (98 per cent)	...	...	2 lb.
Soft soap ...	...	...	$\frac{1}{2}$ lb.
Paraffin ...	...	...	5 pints.
Soft water...	...	...	10 gallons.

The soft soap was dissolved in a gallon of boiling water, and whilst still hot the paraffin was added and beaten up into

a creamy liquid. The whole of the liquid was then pumped with force through a fine spray nozzle, in the usual manner, into another vessel.

The caustic soda was dissolved in 9 gallons of rain water, and into this solution the paraffin emulsion was then poured, and the two well mixed together.

This spray-fluid gave excellent results, and it is proposed to substitute it in future for the caustic alkali wash of caustic soda and carbonate of potash.

In all probability this spray-fluid will prove effective in destroying the eggs of all Aphides and the Red "Spider" also, though it has not yet been tried upon the latter pest.

At the suggestion of the Board of Agriculture, the Foreign Office instructed Mr. Henry Cooke, British Commercial Agent in Russia, to visit the exhibition of poultry which was held at Moscow in November last, and to report on the possibility of opening up a trade in breeding stock. Mr. Cooke reports that although the exhibition was widely advertised as an international one, there were no foreign exhibits. A few enquiries were made at the British Consulate by English poultry-breeders, but it would seem that the latter were not satisfied as to the measures taken for the care of the fowls on the rail journey to and from Moscow, while the severity of the Russian winter during which the show was to be held probably accentuated the anxiety thus felt. The extremely trifling export of fowls for stock or other purposes from the United Kingdom to Russia, moreover, probably led British breeders to think it hardly worth while to incur the risk and expense.

The show was on a very large scale, there being over 1,250 pens, containing two to six birds, as well as larger runs containing twelve to thirty each, mainly turkeys and geese. The breeds of fowls of foreign origin, though bred in Russia, which were chiefly exhibited were the Plymouth Rock, Langshan, Brahma, Minorca, Houdan, and, to a smaller extent, the Wyandotte, Cochín China, Dorking, Orpington, Faverolles, Bantam, and a few others. Ducks were mostly Pekin and

Rouen, with a few of the Aylesbury breed. The breeds of geese exhibited were mostly either Toulouse or Holmagor (a purely Russian breed), as well as Chinese, Emden, and several Russian breeds. Most of the turkeys on show were of the Bronze variety (of American and English origin), with, in addition, a very few White (of French origin), Norfolk and Cambridge. The Bronze is the favourite breed in Russia. The exhibits were of the practical kind for breeding and trading purposes, rather than special fancy breeds.

Though the products of poultry rearing, more especially eggs, are exported in very large and increasing numbers from Russia, rearing, feeding and housing conditions in general are exceedingly primitive, the prevailing type of fowl or duck being of no particular breed or of various crosses, these conditions in general accounting for the comparative smallness of Russian poultry and eggs, and the low prices obtained for them abroad. The numerous poultry exhibitions and annual shows established of late years are, however, gradually introducing some improvement, confined mostly to poultry farms, as distinguished from the poultry rearing of the great mass of the peasants. Good breeds such as those shown at the exhibition are kept only on better-class farms or in the runs of fanciers.

The importation of poultry from abroad is but small, and, judging by the low average value per head, can hardly be breeding stock of any special worth. Though almost all the breeds exhibited at shows are of foreign, mostly British, name and origin, they are now bred in Russia, and judging by the import returns of recent years, the stocks do not seem to be replenished to any extent by fresh imports from abroad, and, least of all, direct from the United Kingdom.

The average value of the 119 "domestic birds of all kinds, including pigeons and singing birds," imported from the United Kingdom in 1903 was about 8s. per head, and of the 49 imported in 1904 about 3s. per head, so that an import trade with Great Britain can hardly be said to exist. Under Section 40 of the Russian Tariff, domestic birds of all kinds are imported into Russia duty free.

Exhibiting at shows, such as that lately held at Moscow, would in Mr. Cooke's opinion undoubtedly be the best means

of bringing British stock to the notice of Russian breeders. He also suggests that British breeders might send their catalogues to the Central Moscow Society and to some of the other leading societies. A list of these can be seen at the offices of the Board. The Poultry Rearing Almanack for 1907 (in Russian) gives a very lengthy list of ten pages of the names of the chief poultry-breeders in all parts of Russia, with the names of the breeds in which they are interested. The exhibition catalogues, too, give names and addresses of all Russian exhibitors. In this connection the following extract from a treatise on poultry rearing in Russia, appended to the exhibition catalogue, is of interest :—" Formerly breeding stock had to be ordered from abroad at great expense, but thanks to amateur fanciers, who have not spared money in ordering breeding stock, the latter is no longer scarce in Russia, but is bred in great quantities and sold at much cheaper prices than was possible ten to twenty years ago. . . . The experience of twenty-four exhibitions has shown that stock bred and exhibited by Russian poultry-breeders has reached such a pitch of excellence as to compete with that ordered from abroad."

In continuation of the series of diagrams of diseases of forest trees, the Board of Agriculture and Fisheries have in preparation, and will shortly publish, a series of **Diseases of Fruit and Fruit-Bearing Plants.** coloured diagrams, prepared under the supervision of the Director of the Royal Botanic Gardens, Kew, illustrating some of the commoner diseases attacking fruit and fruit-bearing plants in this country.

A reduced specimen of one of the diagrams appears on the opposite page.

The diagrams, which are suitable for lecture rooms, museums, or schools, &c., are contained in seven sheets, 21 in. by 15 in., and may be obtained at the office of the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W., only, and not elsewhere, price 1s. per sheet, or 6s. 6d. per set of seven sheets. They will be sent post free on receipt of the money with the order. Each diagram is accompanied by a brief account of the

BOARD OF AGRICULTURE AND FISHERIES.

DISEASES OF FRUIT AND FRUIT-BEARING PLANTS.

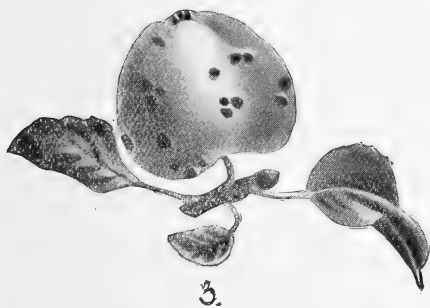
Reduced specimen of one of a series of seven coloured diagrams illustrating some of the commoner diseases of fruit and fruit-bearing plants, issued by the Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W.



1.



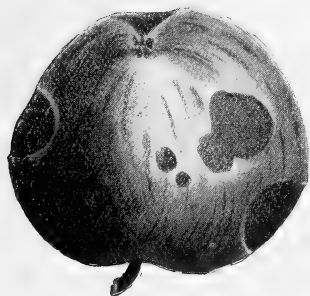
2.



3.



4.



G.M.

1. Strawberry leaf-spot.
3. Apple Rot.

2. Strawberry Mildew.
4. Cherry Scab.



diseases, together with a statement of the measures to be taken for their prevention or eradication, printed in large type, in the form of a wall-sheet. A small handbook giving similar information can also be obtained, price 1d.

The Board are prepared to receive orders at once, and copies will be ready for distribution in about a fortnight.

The following diseases are included in the diagrams :—

No. 1. Strawberry leaf-spot ; strawberry mildew ; apple rot ; cherry scab.

No. 2. Apple mildew ; apple canker ; heart-wood rot ; tree-root rot.

No. 3. Bladder plums ; peach leaf-curl ; shot-hole fungus ; leaf blight.

No. 4. Apple scab ; pear scab ; brown rot.

No. 5. Vine leaf-blotch ; vine leaf-scorch ; black rot of vine ; powdery mildew of vine.

No. 6. Pear leaf cluster-cups ; apricot rust ; American gooseberry disease.

No. 7. Walnut leaf-blotch ; cherry leaf-scorch ; hazel mildew ; silver leaf.

An alteration has been made this year in the mode of publication of the Agricultural Statistics issued by the Board. Refer-

ence was made by Major Craigie, in his

**Acreage and Live
Stock Returns
of Great Britain.**

last Report, to the growth of the annual volume of the Agricultural Returns from 53 pages in 1867 to 368 pages in 1905, and

in view of the increasing demand for statistical information it is not to be expected that this extension has reached its limit. It has been thought, therefore, that it may be more convenient to issue the volume in four parts, which may, if desired, be bound together to form the whole volume as before, or may be separately available for those who wish to possess only some of the tables. The first part (Cd. 3281, price 5d.), which has just been issued, contains the Acreage and Live Stock Returns of Great Britain with summaries for the United Kingdom, and is prefaced by a Report by Mr. R. H. Rew, reviewing some of the principal features in the changes in the cultivated area, the areas devoted to different crops, and the numbers of live stock.

The systematic promotion of agricultural co-operative societies in Great Britain dates from the formation in 1900 of the British

**The Agricultural
Organisation
Society.**

Agricultural Organisation Society. Prior to this date a few societies had been independently formed in different parts of the country, but it was evident that there was

an opening in Great Britain for a society on the same lines as the Irish Agricultural Organisation Society founded by Sir Horace Plunkett. In 1901 an amalgamation was effected between the British Agricultural Organisation Society and the National Agricultural Union, the new society being known as the Agricultural Organisation Society. In the Society's report for the period ending June, 1906, the following figures are given, showing the progress which has been made in the five years of the Society's existence since April, 1901 :—

	1901.	1905.
Societies existing	12	134*
Number of counties in which there are affiliated societies	4	41*
Total membership of affiliated societies	517	7,439
Total turn-over of affiliated societies	£9,467	£221,524

* June, 1906.

The 134 societies which were in existence in June, 1906, were made up of 96 societies for the supply of requirements or sale of produce ; 12 dairy societies ; 11 credit societies ; 4 allotment societies ; 3 motor service societies, and 8 miscellaneous societies. Some of the societies, however, engage in more than one kind of business, and might be classified under several of these headings.

Two central societies, off-shoots of the Agricultural Organisation Society, have recently been formed, one being a trading federation of agricultural co-operative societies and the other a central credit bank. The Agricultural Co-operative Federation, Limited, which was formed in 1905, took over the work previously carried on by the Advisory Business Department, and now has fifty-three societies federated to it. It is a trading body purchasing goods on commission on behalf of its societies, and is, therefore, naturally in a much stronger position to make terms with wholesale firms than any single society would be. This

has already been indicated by the further concessions which have been granted to it by various firms, and also by the fact that dealers are now offering far better terms to the societies than they did prior to the existence of the Federation. Manufacturers also are, it is stated, finding it to their advantage to deal with societies through the Federation.

The Central Co-operative Agricultural Bank, Limited, which has been in course of formation during 1906, will, it is hoped, remove the chief difficulty encountered in the formation of agricultural credit societies, viz., the difficulty of obtaining capital, and that consequently the number of such societies will increase more rapidly than has hitherto been the case.

Another off-shoot from the Agricultural Organisation Society is the Scottish Agricultural Organisation Society, which was formed in the course of 1905. Owing principally to the difficulty and expense of sending organisers to places at a great distance from London very little progress had up to that time been made in forming societies in Scotland, and it was to carry on this work that a propagandist society on similar lines was formed in that country. An arrangement has been made whereby the Farmers' Supply Association of Scotland can act as the trading federation of local agricultural co-operative societies formed in Scotland.

The report shows that the work of the Agricultural Organisation Society continues to make satisfactory progress, but an appeal is made for additional funds in order to enable an extension in directions which at present have to be almost entirely neglected.

In the second portion of the report an account is given of the work of the affiliated societies. Among new developments, mention may be made of the successful introduction of the co-operative sale of live stock by the Winchcombe Co-operative Auction Mart, which commenced business in February, 1905. The Mart has proved a complete and striking success. During 1905 eleven sales were held, at which 1,074 beasts, 3,084 sheep, and 1,363 pigs were disposed of, the total amount realised being £17,459, the prices throughout comparing favourably with the prices ruling in other markets in the county. The receipts from commissions, &c., amounted to £254 1s. 11d., and the expenses to £89 7s. 5d.

The paid-up share capital of the Society was £975. Land was acquired and a market constructed at a total cost of £1,427, the Society raising a mortgage of £400 upon the land. After paying interest on the mortgage and share capital and other charges the Society made a net profit of £100 19s., the greater portion of which was distributed amongst the members as a bonus upon their sales through the Society.

A scheme is on foot for the establishment of a similar co-operative auction market at Winchester.

Another form of co-operation which might be taken up by agricultural co-operative societies is its application to the improvement of live stock. Very few societies have as yet done anything in this direction.

The Buckingham Agricultural Trading Association has made an arrangement with the owner of a Shire stallion, whereby the horse shall be at the service of any member for his mares, at £1 5s. per mare, instead of the usual fee of £2 2s. All such mares are booked and paid for by the Association, which collects the service fees from the members, deducting a commission of $2\frac{1}{2}$ per cent. for doing so.

The Lledrod Agricultural Society, Cardiganshire, has adopted a different system. The Society has not, as a society, undertaken the improvement of stock, but groups of eight, ten or twelve members have been formed to purchase bulls. A service fee of 1s. is charged to those who shared in the cost of the bull; to others a charge of 2s. 6d. is made. When the bull is sold, each of the contributing members receives back what he paid, and if there is any profit, it is handed over to the member by whom the bull was kept.

Several co-operative allotment societies have been formed which hire land direct and let it out to their members.

A School of Agricultural Mechanics has been in existence during the past four years at Mons, in Belgium, where theoretical and practical instruction in the maintenance and repair of agricultural machines is given to mechanics, blacksmiths, farriers, &c. In country districts these local artificers are the only resource for the repair of the complicated

**School of Agricultural Mechanics
in Belgium.**

agricultural machinery imported from abroad—a task for which they often prove themselves unfitted. There seemed, therefore, to be an opening for a useful form of technical education, which would be of benefit both to the men themselves and to the agricultural community. The course includes the elements of agriculture, physics and mechanics in their relation to machinery; the materials employed; the different classes of machines and methods of working, motive power, &c. The practical instruction deals with the making of rough drawings and plans; the use of tools; and the repair, maintenance, and management of machinery.

The course extends over three months in the winter for three days in each week, the afternoons of the days when lectures are given being devoted to instruction in drawing and in the workshop, while practical training in using ploughing, sowing and reaping machines is also given in the summer. The instruction is given gratuitously, and a certificate is conferred upon those students who show themselves capable and possess sufficient practical knowledge.

It is proposed to establish a course of instruction of a more advanced type in the construction of agricultural machinery.

[*Annales de Gembloux*, October 1st, 1906.]

Committee of the Meteorological Office.—The Lords Commissioners of H.M. Treasury, at the suggestion of the Board of Agriculture and Fisheries, have appointed

**Miscellaneous
Notes.**

Mr. T. H. Middleton, M.A., M.Sc., as the Board's representative on the Committee of the Meteorological Office, in the place of Dr. W. Somerville, resigned.

Export of Russian Flour to the United Kingdom.—The Board are informed through the Foreign Office that a proposal is to be laid before the Russian Millers' General Conference to establish an agency for the sale of Russian flour in England, and to assign a sum of £1,052 annually for expenses in connection therewith.

The total export of Russian wheat flour is about 2,000,000 cwt., most of which goes to Turkey and Finland, about 115,000 cwt. coming to this country.

Poultry Show at Paris.—An International Poultry Exhibition, organized by the *Société des Aviculteurs Français* will be held at Paris from 5th to 12th February, 1907. Goods intended for the Exhibition will be allowed to be forwarded direct to the Exhibition Buildings without Customs inspection at the frontier.

Siberian Butter Exports.—The British Commercial Agent in Russia (Mr. H. Cooke) reports on the authority of the official *Commercial and Industrial Gazette* that owing to the increasing demands of the English and German markets, and to the growing development of the Siberian production, the export of Siberian butter for the first ten months of the current year has exceeded the twelve months' export of any previous year. The export from Cheliabinsk, the Siberian western frontier station, by rail, amounted in these ten months to 2,702,846 pouds (97,605,174 lb.) as against 1,938,000 pouds in 1905.

Importation of Lucerne Seed into Argentina.—The Board are informed through the Foreign Office that by a Decree dated the 27th of November, 1906, Article 2 of the Decree of March 18th, 1905,* concerning the importation into Argentina of the seed of lucerne and other forage plants has been cancelled. This article required that applications to import these classes of seeds should be accompanied by a certificate from a competent scientific authority of the country of origin certifying that the seed was free from dodder. Article 1 of the Decree, however, still remains in force, and prohibits the importation of the seed of forage plants containing more than 50 grains of dodder per kilogramme (= 22·7 grains per pound).

* See *Journal*, June, 1905, p. 161.

ADDITIONS TO THE LIBRARY.

Australia—

Tasmania.—Secretary of Agriculture and Chief Inspector of Stock. Report for 1905-6. (20 pp.)

Austria-Hungary—

Marchet, Julius.—Holzproduktion und Holzhandel von Europa, Afrika und Nord Amerika. Band II. Vienna: Frick, 1905.

France—

Hubert, Lucien.—L'Agriculture et la Republique. Paris: Librairie d'Education Nationale, 1906.

Roux, Paul.—Le "Bauer" de la Lande du Lunebourg; comment il s'est adapté aux transformations modernes. (La Science Sociale; 21^e année. Fascicule 23). Paris: Bureaux de la Science Sociale, 1906.

Germany—

Rybark, Dr. J.—Die Steigerung der Produktivität der deutschen Landwirtschaft im neunzehnten Jahrhundert. (55 pp.) Berlin: Paul Parey, 1905.

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten, Heft 123:—Betriebsverhältnisse der deutschen Landwirtschaft. (117 pp.) Berlin: Paul Parey, 1906.

Great Britain—

Cox, Harold.—Land Nationalization and Utilization. 2nd Edition. (238 pp.) London: Methuen, 1906.

County of Northumberland.—Bull. 8:—Report on Tree Field Pasture Plots, 1897-1905; Hanging Leaves Pasture Plots, 1903-1906; Palace Leas Old Land Hay Plots, 1897-1905. (81 pp.) 1906.

Memoirs of the Geological Survey.—Summary of Progress of the Geological Survey of the United Kingdom and Museum of Practical Geology, 1905. (204 pp.) London: Stanford, 1905.

Cousins, H. H.—Farm Foods (from "Landwirtschaftliche Fütterungslehre," by Prof. Emil v. Wolff). (365 pp.) London: Gurney & Jackson, 1895.

Aberdeen and North of Scotland College of Agriculture.—Leaflet No. 3. Turnip Manuring Experiments. Report, 1905. (6 pp.) 1906.

Departmental Committee on Small Holdings: Report. [Cd. 3277.] (61 pp.) Price 6d; Minutes of Evidence. [Cd. 3278.] (542 pp.) Price 4s. 5d. London: Wymans, 1906.

Italy—

Giordano, F.—Le Ricerche Sperimentali di Meccana Agraria. (321 pp.) Milan: Leopoldo Beretta, 1906.

Spain—

Beneite, José de la Mano.—El absentismo y los Latifundios, Salamanca; Imp. de Calatrava a cargo de L. Rodriguez, 1905. 1 peseta.

United States—

Jordan, W. H.—The Feeding of Animals. (450 pp.) The Rural Science Series. New York: The MacMillan Company, 1905.

Voorhees, E. B.—Fertilisers. (335 pp.) The Rural Science Series. New York: The MacMillan Company, 1905.

Secretary of Agriculture.—Report, 1906. (112 pp.)

Farmers' Bulletin:—

No. 268. Industrial Alcohol: Sources and Manufacture. (45 pp.) 1906.

No. 269. Industrial Alcohol: Uses and Statistics. (29 pp.) 1906.

Bureau of Statistics.—Bull. 48. The Cost of Producing Farm Products. (90 pp.) 1906.

Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of December, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK:—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle:—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	8 1	7 4	38 1	34 1
Herefords	7 10	7 5	—	—
Shorthorns	7 10	7 3	36 8	33 5
Devons	8 2	7 8	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	9½	6½
Sheep:—				
Downs	9½	8½	—	—
Longwools	9	8	—	—
Cheviots	9½	9	9½	8½
Blackfaced	8½	8½	9½	8
Cross-breds	9½	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs:—				
Bacon Pigs	6 7	6 2	6 4	5 8
Porkers	7 7	6 11	7 0	6 4
LEAN STOCK:—	per head.	per head.	per head.	per head.
Milking Cows:—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 5	18 4	20 19	17 7
„ —Calvers	21 11	17 15	19 9	16 10
Other breeds—In Milk ...	17 12	15 10	19 0	16 8
„ —Calvers	14 15	12 17	18 3	16 2
Calves for Rearing	2 0	1 11	2 2	1 8
Store Cattle:—				
Shorthorns—Yearlings ...	8 14	7 15	9 1	7 15
„ Two-year-olds	12 15	11 6	13 14	11 14
„ Three-year-olds	15 0	13 16	14 10	—
Polled Scots—Two-year-olds	—	—	14 15	12 11
Herefords— „	13 10	12 0	—	—
Devons— „	12 2	10 8	—	—
Store Sheep:—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	43 5	38 1	—	—
Scotch Cross-breds	—	—	34 3	30 6
Store Pigs:—				
Under 4 months	28 4	21 0	19 6	17 3

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of December, 1906.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	49 6	48 6	46 6	53 6*	54 0*
	2nd	49 6	44 0	43 6	43 6	—	47 6*
Cow and Bull	1st	37 6	41 6	40 0	39 0	42 6	43 0
	2nd	—	35 6	35 6	34 0	34 0	35 0
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	51 6	47 0	45 6	48 6	—	—
	2nd	46 6	40 0	41 0	43 6	—	42 0
Argentine Frozen—							
Hind Quarters ...	1st	34 0	35 6	35 0	34 0	36 0	36 6
Fore „ ...	1st	31 0	30 6	30 6	29 0	30 6	32 0
Argentine Chilled—							
Hind Quarters ...	1st	41 0	41 6	35 6	35 0	—	40 6
Fore „ ...	1st	31 6	29 6	31 6	29 6	—	33 0
American Chilled—							
Hind Quarters ...	1st	53 0	50 6	50 0	50 0	53 0	53 0
Fore „ ...	1st	36 0	34 6	33 0	33 0	36 0	36 0
VEAL :—							
British	1st	70 0	59 0	73 6	74 6	—	—
	2nd	65 6	43 0	64 0	66 0	—	—
Foreign	1st	73 0	—	—	—	—	63 0
MUTTON :—							
Scotch	1st	70 6	70 0	77 0	75 0	75 0	67 6
	2nd	66 0	60 6	72 6	70 0	60 0	57 0
English	1st	69 0	70 0	73 0	70 0	—	—
	2nd	62 6	56 0	66 6	65 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	70 0	—	—	—	—
Argentine Frozen ...	1st	35 0	36 6	36 0	37 6	37 6	37 6
Australian „ ...	1st	35 6	35 0	37 6	36 0	37 6	—
New Zealand „ ...	1st	48 6	46 6	47 0	47 0	37 6	—
LAMB :—							
British	1st	—	—	—	—	—	—
	2nd	—	—	—	—	—	—
New Zealand	1st	67 6	60 6	—	58 6	—	—
Australian	1st	59 0	58 0	57 6	57 6	58 6	—
Argentine	1st	60 6	—	—	—	—	—
PORK :—							
British	1st	63 6	67 6	70 6	66 6	56 0	61 0
	2nd	59 0	57 0	64 0	60 0	53 0	49 6
Foreign	1st	60 6	61 6	62 0	62 0	56 0	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1906, 1905, and 1904.

Weeks ended (<i>in</i> 1906).	Wheat.						Barley.						Oats.					
	1904.		1905.		1906.		1904.		1905.		1906.		1904.		1905.		1906.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 6	26	6	30	4	28	4	22	6	24	4	24	6	15	7	16	3	18	2
" 13	26	11	30	4	28	6	22	3	24	6	24	8	15	9	16	3	18	4
" 20	27	3	30	5	28	5	22	4	25	0	24	11	15	11	16	5	18	4
" 27	26	11	30	6	28	7	22	3	25	1	25	1	15	8	16	7	18	7
Feb. 3	26	9	30	6	28	10	22	4	25	0	25	1	15	11	16	7	18	10
" 10	26	8	30	7	28	10	22	2	25	2	25	3	15	9	16	8	18	10
" 17	26	11	30	5	28	11	22	7	25	2	25	6	16	0	16	9	19	0
" 24	27	10	30	10	28	10	22	4	25	0	25	4	16	3	16	10	19	0
Mar. 3	28	8	30	8	28	8	22	6	25	2	25	0	16	5	16	10	19	0
" 10	29	1	30	9	28	5	22	5	25	2	25	1	16	8	16	10	18	8
" 17	28	6	30	10	28	5	22	9	24	11	24	8	16	7	16	10	18	10
" 24	28	2	30	9	28	4	22	8	25	2	24	4	16	7	17	0	18	8
" 31	27	11	30	9	28	3	22	10	25	1	24	5	16	6	16	11	18	11
Apl. 7	27	10	30	9	28	7	22	5	25	6	24	2	16	5	17	0	18	11
" 14	27	9	30	8	28	11	22	6	24	3	24	4	16	4	17	6	19	4
" 21	27	9	30	8	29	4	22	0	24	4	24	0	16	4	17	5	19	1
" 28	27	8	30	9	29	6	21	1	24	4	24	0	16	3	17	9	19	6
May 5	27	4	30	8	29	10	20	8	25	3	23	10	16	7	18	0	19	9
" 12	27	1	30	8	30	1	19	10	24	10	24	1	16	6	18	3	20	0
" 19	26	9	30	10	30	3	20	4	24	8	23	10	16	7	18	5	20	1
" 26	26	9	30	11	30	4	19	8	24	4	24	2	16	7	18	8	20	2
June 2	26	10	31	3	30	4	18	8	23	6	22	10	16	8	19	1	20	5
" 9	26	6	31	4	30	3	18	5	24	0	23	4	16	10	18	11	19	11
" 16	26	5	31	7	30	4	18	2	26	0	23	6	16	8	19	1	20	2
" 23	26	5	31	7	30	5	19	2	23	9	22	10	16	10	18	10	20	2
" 30	26	4	31	8	30	3	18	8	23	2	24	3	17	1	19	7	20	1
July 7	26	6	32	1	30	2	19	8	22	11	23	0	17	1	19	6	20	2
" 14	26	10	32	3	30	5	18	9	23	10	23	8	17	6	19	7	20	4
" 21	27	7	32	2	30	3	18	10	23	7	23	2	17	6	18	11	20	5
" 28	28	0	32	3	30	5	19	9	23	11	22	4	17	10	19	3	20	2
Aug. 4	28	3	31	11	30	9	19	9	22	0	22	1	17	10	18	4	19	3
" 11	28	4	30	5	30	5	19	9	22	5	23	0	17	7	16	11	17	11
" 18	28	8	28	5	29	0	22	5	23	4	24	2	16	7	16	4	17	0
" 25	29	5	27	1	27	9	23	2	23	6	25	0	16	5	15	9	16	10
Sept. 1	30	2	26	11	25	9	25	3	23	5	24	3	16	3	15	9	16	6
" 8	30	0	27	1	26	4	24	10	23	4	24	9	16	1	15	11	16	3
" 15	29	7	26	11	25	11	24	9	23	7	24	3	15	11	16	0	16	1
" 22	29	10	26	8	25	9	25	10	23	10	24	3	15	9	15	11	16	0
" 29	29	10	26	9	25	9	25	5	24	3	24	8	15	8	16	1	16	2
Oct. 6	30	2	26	9	26	1	25	6	24	9	25	0	15	9	16	3	16	3
" 13	30	5	26	11	26	3	25	4	24	10	25	3	15	8	16	6	16	7
" 20	30	4	27	1	26	6	25	5	25	0	24	10	15	11	16	7	16	8
" 27	30	6	27	4	26	7	24	11	24	11	24	10	15	10	16	8	16	10
Nov. 3	30	6	27	10	26	7	25	0	24	9	24	8	16	0	17	1	16	11
" 10	30	3	28	3	26	6	24	6	24	10	24	8	15	11	17	4	17	1
" 17	30	2	28	7	26	4	24	5	24	6	24	4	16	0	17	8	17	2
" 24	30	5	28	5	26	3	24	4	24	6	24	1	16	1	17	9	17	3
Dec. 1	30	4	28	8	26	1	24	6	24	6	24	1	16	2	17	11	17	2
" 8	30	4	28	6	26	1	24	4	24	7	24	1	16	2	17	11	17	4
" 15	30	4	28	5	26	1	24	4	24	5	23	11	16	2	17	11	17	3
" 22	30	3	28	4	26	3	24	7	24	6	24	3	16	1	17	11	17	3
" 29	30	4	28	3	26	0	24	8	24	7	24	1	16	2	18	1	17	3

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and Breslau.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: November ...	38 9	39 6	24 3	26 1	20 8	22 11
December ...	39 6	39 7	24 9	26 4	20 10	23 0
Paris: November ...	39 11	40 4	25 1	26 7	21 7	23 5
December ...	39 9	40 2	25 5	26 7	22 4	23 3
Belgium: October ...	30 6	28 7	22 10	24 3	20 0	18 6
November ...	30 9	28 4	23 7	24 9	20 9	18 9
Berlin: October ...	38 0	38 6	—	—	20 11	22 4
November ...	39 1	38 11	—	—	21 9	22 9
Breslau: October ...	34 1	37 11	25 9	28 8 (brewing) 23 3 (other)	19 1	20 8
November ...	34 9	37 11	27 5	29 3 (brewing) 23 3 (other)	20 1	21 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of December, 1905 and 1906.

	WHEAT.		BARLEY.		OATS.	
	1905.	1906.	1905.	1906.	1905.	1906.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	29 11	27 1	24 7	24 3	18 11	17 10
Norwich ...	28 7	25 11	24 5	24 3	17 9	16 10
Peterborough ...	27 9	25 1	24 1	22 10	17 6	16 6
Lincoln ...	27 11	25 5	23 10	23 5	17 9	16 7
Doncaster ...	28 0	25 7	23 6	23 7	17 7	17 0
Salisbury ...	28 5	26 0	25 6	24 2	18 3	17 8

CORN PRICES:—ANNUAL AVERAGES.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Weekly Averages of Corn Returns from the Returning Markets, together with the QUANTITIES returned as sold at such Markets during each of the years 1900 to 1906.

YEARS.		PRICES.			QUANTITIES.		
		Wheat.	Barley.	Oats.	Wheat.	Barley.	Oats.
		s. d.	s. d.	s. d.	Quarters.	Quarters.	Quarters.
1900	...	26 11	24 11	17 7	2,923,483	3,190,793	711,784
1901	...	26 9	25 2	18 5	2,605,550	3,369,629	714,215
1902	...	28 1	25 8	20 2	2,247,937	2,783,424	831,285
1903	...	26 9	22 8	17 2	2,296,723	2,875,749	1,049,995
1904	...	28 4	22 4	16 4	2,138,142	3,437,176	1,316,516
1905	...	29 8	24 4	17 4	2,467,551	3,265,613	1,073,611
1906	...	28 3	24 2	18 4	2,684,101	3,210,995	1,011,931

AVERAGE VALUE per IMPERIAL QUARTER OF WHEAT IMPORTED into the UNITED KINGDOM from the under-mentioned Foreign Countries and British Possessions in the years 1904, 1905, and 1906.

Countries from which Exported.				Average Value per Imperial Quarter.		
				1904.	1905.	1906.
				s. d.	s. d.	s. d.
Argentine Republic	...	...	...	30 1	30 7	29 10
Chile	...	...	...	30 8	30 4	—
Germany	...	...	...	31 2	31 11	27 7
Bulgaria	...	...	...	28 7	29 4	—
Roumania	...	...	...	29 5	31 0	28 11
Russia	...	...	...	30 9	31 9	29 10
Turkey	...	...	...	25 4	28 1	28 11
U.S. of America	{ Atlantic	...	...	30 7	31 9	30 7
	{ Pacific...	...	...	30 9	31 7	30 11
India, British	...	...	...	28 7	29 8	29 4
North America, British	...	...	...	30 10	31 8	30 8
Australia	...	...	...	31 4	32 4	31 2
New Zealand	...	...	...	29 7	30 1	32 2

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of December, 1906.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Manchester.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
British... ..	16 0	14 0	—	—	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish	112 0	—	118 0	115 6	111 0	108 0	—	—
Danish	120 6	118 0	124 0	120 6	122 6	119 6	122 0	—
Russian	104 0	100 0	119 0	116 0	101 0	95 0	106 0	97 6
Australian ...	109 6	106 6	113 0	112 0	110 0	106 6	112 0	105 6
New Zealand...	112 6	110 0	115 6	113 6	113 0	111 0	113 6	—
CHEESE :—								
British, Cheddar	86 0	79 6	—	—	80 0	76 0	67 6	63 0
			120 lb.	120 lb.	120 lb.	120 lb.		
„ Cheshire	—	—	80 6	73 0	80 0	75 0	—	—
			per cwt.	per cwt.	per cwt.	per cwt.		
Canadian ...	63 0	62 0	64 6	62 6	62 0	60 6	64 0	60 0
BACON :—								
Irish	58 6	56 6	60 0	57 0	59 6	57 0	63 0	60 6
Canadian ...	53 0	51 0	56 6	53 0	54 0	50 0	55 0	51 6
HAMS :—								
Cumberland ...	113 0	109 6	—	—	—	—	—	—
Irish	116 0	110 6	—	—	—	—	92 0	84 0
American (long cut) ...	65 6	63 6	65 6	62 0	63 6	61 0	64 6	61 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	20 0	18 4	—	—	—	—	—	—
Irish	18 7	15 11	15 4	14 3	15 1	14 3	15 6	13 10
Danish	16 6	14 3	—	—	15 10	14 10	16 1	14 9
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy	70 0	60 0	—	—	—	—	52 6	47 6
Scottish Triumph	75 0	70 0	86 6	70 0	51 6	46 6	—	—
Up-to-Date ...	72 6	65 0	70 0	55 0	51 6	46 6	47 6	43 0
HAY :—								
Clover... ..	103 0	91 6	91 0	78 6	100 0	77 0	82 0	77 0
Meadow	96 6	85 6	74 0	66 6	—	—	79 6	74 6

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	185	92	1,280	817
Swine Slaughtered as diseased or exposed to infection ...	1,073	600	7,359	3,876
Anthrax :—				
Outbreaks	106	91	939	970
Animals attacked	141	120	1,325	1,317
Glanders (including Farcy) :—				
Outbreaks	74	102	1,070	1,214
Animals attacked	131	163	2,012	2,068
Sheep-Scab :—				
Outbreaks	140	140	534	918

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	DECEMBER.		12 MONTHS ENDED DECEMBER.	
	1906.	1905.	1906.	1905.
Swine-Fever :—				
Outbreaks	4	—	95	137
Swine Slaughtered as diseased or exposed to infection ...	132	1	1,103	1,416
Anthrax :—				
Outbreaks	—	1	4	4
Animals attacked	—	1	8	6
Glanders (including Farcy) :—				
Outbreaks	—	2	8	31
Animals attacked	—	7	16	107
Rabies (number of cases) :—				
Dogs	—	—	—	—
Sheep-Scab :—				
Outbreaks	43	62	256	339

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AGRICULTURAL EDUCATION IN ENGLAND AND WALES.

Within the last twenty years there has been a great extension in the facilities for agricultural education in England and Wales, and at the present time the colleges, schools, and courses of lectures which afford opportunities to the farming community for obtaining scientific and technical instruction are numerous and well adapted to modern requirements.

The need for an efficient system of agricultural instruction began to be generally recognized in 1887, and the Departmental Committee appointed to enquire into the subject reported that "there is clear proof of great loss to the country through a want of a widespread knowledge of the most effective modes of dairy practice and of certain other agricultural operations." At that time the provision for agricultural education of any sort was extremely scanty, and the independent colleges at Cirencester, Downton, Aspatria, and Hollesley Bay seem to have been the only centres at which general instruction in agriculture was given in England, and none of these were of a type altogether suitable for the ordinary tenant farmer.

The immediate result of the Committee's report was that in 1888 Parliament voted a sum of £5,000 to be distributed in the form of direct grants to Agricultural and Dairy Schools, and for assistance in agricultural experiments. Before the stimulus thus afforded had time to take much effect, the passing of the Local Taxation (Customs and Excise) Act of 1890 introduced a new and most important factor into the

question of providing agricultural education by placing at the direct disposal of County Councils large sums of money for technical instruction. The result of this Act was that a considerable sum of money, amounting in recent years to £80,000 or £90,000 annually, has been expended by local authorities in aid of agricultural education.

Under these new conditions, the Board took the view that all the cost of instruction of a purely local character might fitly fall upon the local authorities. They decided to concentrate their much more limited funds on the development of institutions of a more or less central character, through whose machinery a great deal, if not all, of such local work could be carried on under proper and skilled supervision, and whose work and influence need not be confined to a single county.

Another object the Board had in view in assisting institutions of this class was the provision and maintenance of facilities for enabling the rising generation of agriculturists to obtain a thorough training in the science of their business. Concurrently with this object, the Board also desired to provide opportunities for farmers to obtain advice on all technical matters affecting their calling, while another and not less important purpose was the training of teachers and lecturers to meet the demand created by the extension of local instruction.

For many years the bulk of the Board's funds has been devoted to assisting educational institutions working for groups of counties, many of them of the type of a University College, but recently grants have also been given to certain other centres acting in a more restricted area. The total amount of the grants thus distributed was £10,550 in 1905-6.

There are now nineteen institutions receiving grants from the Board. Nine of these are collegiate centres, each of which receives a grant from, and acts in connection with, several County Councils.

The remaining ten institutions differ somewhat in type, either from the fact that they are supported by one County Council, or are devoted to some special object such as dairying, or are farm schools like those at Basing and Penrith.

In the following list they are arranged roughly in districts with the counties with which they are connected :—

North of England and North Wales.

1. Armstrong College, Newcastle-upon-Tyne.
2. Cumberland and Westmorland Farm School, Newton Rigg, Penrith.
3. The University of Leeds.
4. The Harris Institute, Preston.
5. College of Agriculture and Horticulture, Holmes Chapel.
6. University College of North Wales, Bangor.

Midland Counties and South Wales.

7. Midland Agricultural and Dairy College, Kingston, Derby.
8. Harper-Adams Agricultural College, Newport, Salop.
9. University College of Wales, Aberystwyth.

Eastern Counties.

10. Cambridge University.
11. Eastern Counties Dairy Institute, Ipswich.
12. Essex County Technical Laboratories, Chelmsford.
13. Agricultural Institute, Ridgmont.

Southern and South-Western Counties.

14. University College, Reading.
15. British Dairy Institute, Reading.
16. South-Eastern Agricultural College, Wye.
17. Agricultural and Horticultural College, Uckfield.
18. Hampshire Farm School, Basing.
19. The National Fruit and Cider Institute, Long Ashton, Bristol.

Counties with which the Institutions Act.

Northumberland, Durham, Cumberland, and Westmorland.
Cumberland and Westmorland.

The Three Ridings of Yorkshire.
Lancashire.
Cheshire.

Anglesey, Carnarvon, Flint, Denbigh, and (part of) Montgomery.

Nottingham, Leicester, Derby, and Lincoln (Lindsey).
Shropshire and Stafford.

Cardigan, Carmarthen, Brecon, Pembroke, Merioneth, Radnor, and (part of) Montgomery.

Bedford, Cambridge, Essex, Hertford, Huntingdon, Isle of Ely, Norfolk, Northampton, East and West Suffolk.
Counties in East Anglia.

Essex, and counties in East Anglia.

Bedford, and adjacent counties.

Berks, Bucks, Dorset, Hants, and Oxford.

—
Kent and Surrey.

East Sussex.

Hants.

Devon, Gloucester, Hereford, Monmouth, Somerset, and Worcester.

Looking at the map which accompanies this list, it may be said that provision for agricultural instruction is now made to a greater or less extent over a considerable part of England and Wales. It is true that a number of counties in the centre and West of England, such as Warwick, Worcester, Hereford, and Gloucester, have not yet definitely associated themselves with any centre for agricultural instruction, except the Fruit and Cider Institute, but to a certain extent the needs of agricultural students residing in them may be met by the various adjacent centres. The south-western counties of Cornwall, Devon, and Somerset, however, lie at some distance from any recognized centre, but the needs of this district will in the near future be met by the establishment of a Collegiate Centre out of funds provided under the will of the late Mr. C. Seale-Hayne.

There is naturally a good deal of variation in the instruction given in these several institutions, and it has always been the policy of the Board to avoid any appearance of attempting to introduce rigid uniformity into the curricula, but many of the teaching courses have a sufficient resemblance to admit of a general description.

Courses for Degrees in Agriculture.—Degrees of B.Sc. in agriculture are granted by the Universities of Wales, Leeds, Durham, and London, and students can be prepared for graduation at Bangor and Aberystwyth, Leeds, Newcastle, and Wye, while at Cambridge, the ordinary B.A. degree may be obtained through the medium of a "Special" Examination in Agricultural Science. In the case of the London degree residence at the Wye College is not compulsory. The courses of instruction usually extend over three years after matriculation, and include practical work. The subjects cover the whole field of agriculture, and are of an advanced scientific character.

Diplomas in Agriculture.—A number of institutions grant diplomas in agriculture, viz.: the Bangor, Newcastle, Aberystwyth, Reading, Wye, Midland, Holmes Chapel, Uckfield, and Harper-Adams Colleges, and the Harris Institute, Preston. These diplomas are awarded to students who have attended a somewhat shorter or less exhaustive course than that necessary for a degree, and who have passed the necessary examinations. The courses last from two to three years, and include practical work. At Cambridge the diploma in agriculture is of a different character, and it is usually taken as a post-graduate course, and while not confined to graduates of the University, it is intended chiefly for students who have either taken an Honours Degree in Natural Science, or have passed the Special examination in Agricultural Science for the ordinary B.A. degree.

In most cases these courses of study also serve as a preparation for the examination for the National Diploma in Agriculture awarded jointly by the Royal Agricultural Society and the Highland and Agricultural Society of Scotland.

At the Wye, Harper-Adams, and Uckfield Colleges, two-year "certificate" courses are also provided.

Shorter Courses.—Most of the institutions also provide instruction extending over shorter periods, suited more especi-

ally for young men, farmers' sons and others, intending to become practical farmers, who do not wish to take such a long course as any of the foregoing. They vary very considerably in duration from five or six weeks to six months and over.



MAP SHOWING POSITION OF EDUCATIONAL INSTITUTIONS AIDED BY THE BOARD (See list on page 643).

Special Instruction in Dairying.—Instruction in dairying is given at most of the Agricultural Colleges as part of the ordinary training, but dairying also forms a separate subject in which short courses of practical and theoretical instruction are given at Bangor, Newcastle, Leeds, Aberystwyth, Reading,

Kingston, Chelmsford, and the British and the Eastern Counties Dairy Institutes.

The subject receives, however, special attention at the University College, Reading, which is in connection with the British Dairy Institute, and at the Midland Dairy College, Kingston, Derby. At Reading, a diploma in dairying is awarded at the end of a two years' course in scientific and practical dairying, which is designed for candidates who wish to become dairy teachers or managers of dairies. A certificate in dairying is also given after one year's study at the College and the passing of prescribed examinations, including one in practical dairy work.

At Kingston, also, similar courses are held, extending over not less than nine months.

Special Instruction in Horticulture.—The only College of University type in which a special course in horticulture is arranged is that at Reading. It is designed for students who intend to take up horticulture as a career. It provides training in the sciences on which the practice of horticulture is based, in market and florist work, and in fruit-growing. A diploma is awarded at the end of two years. A one year's course is also provided for those who wish to become teachers in botany and horticulture in primary and secondary schools.

Instruction in horticulture is also given at Holmes Chapel and Uckfield, where courses of two to three years are arranged, and pupils are granted certificates or diplomas.

The National Fruit and Cider Institute partakes very largely of the nature of a station for experimental research, but it is so far educational that fruit-growers and cider-makers may obtain assistance and advice bearing upon their industry, and can visit the Institute for the purpose of seeing the methods advocated demonstrated in practice, while working pupils are received for periods of not less than one year for instruction in fruit-growing.

Courses of instruction for young gardeners in the principles and operations of horticulture, including fruit, vegetable, and flower culture, are arranged in connection with the County Technical Laboratories, Chelmsford. The complete course covers three terms of three weeks each and one of four and a half weeks.

Special Instruction in Poultry-keeping.—The headquarters of instruction in this branch of farming may be said to be at Reading. A college poultry farm is maintained for purposes of practical training, and a certificate in aviculture is awarded after one year's study at the College, three months' practical training in poultry-keeping, and the passing of the prescribed examinations. Short courses are also held.

A special course in poultry-keeping is also given at Uckfield College and certificates are awarded to successful students.

Poultry-keeping, however, is a subject to which considerable attention is now given at a number of the colleges and schools.

Special Instruction in Forestry.—There are two centres receiving aid from the Board where definite instruction in forestry is given, viz., at Bangor and Newcastle-on-Tyne, and opportunities for instruction are also available in other directions. At Bangor a certificate in forestry is awarded to qualified students, the course covering one year.

The Senate of Cambridge University has approved of a proposal for granting a diploma in forestry, and arrangements for carrying this into effect are now in progress.

Instruction in forestry is now provided by H.M. Commissioners of Woods at the Alice Holt Woods in Hampshire and at the Forest of Dean. The University of Oxford has also taken up the subject of forestry instruction in connection with the scheme for training probationers for the Indian Forest Service at Oxford, and a diploma in forestry will be granted to members of the University who have pursued an approved course of study, and who, after undergoing a course of practical work, have satisfied the examiners in the prescribed examinations.

The foregoing brief summary of the educational facilities which are now available for the present generation of agriculturists in England and Wales in the colleges and institutions aided by the Board, refers to what may be termed their "internal" work, and does not take into account the work carried on in the various counties with which they are connected by means of lectures, travelling dairy and farriery schools, and demonstration plots, nor of the similar work done directly by County Councils.

A list of the staffs of each of the colleges and a description of the courses of instruction, the subjects taught, together with the Report of the Board's Inspector on the year's work, is given annually in the Report on the Distribution of Grants for Agricultural Education, but as the circulation of this Report is more or less limited, it is thought that it may be useful to supplement the above account with a short note as to each of the colleges taken from their published reports.

1. *Armstrong College, Newcastle-upon-Tyne*.—The course for the degree of B.Sc. in agriculture covers three years of three terms each, and that for the diploma three years of two winter terms only. Students can also attend for single terms or for special subjects. The tuition fees vary from £10 for a winter's course of instruction in agriculture to £20 a year for the degree course. Students may attend any of the classes on payment of the class fees.

The Northumberland County Council Experimental Station at Cockle Park, which is worked in connection with the Department, extends to 400 acres, and affords opportunities for practical instruction and experimental research work.

In Durham the County Council have made arrangements for instruction and research in dairying to be carried out on a dairy farm of nearly 600 acres, where about 60 milch cows are kept.

For instruction in forestry, there are experimental plantations and tree nurseries at Cockle Park, while by an arrangement with H.M. Office of Woods, the Chopwell Woods, which extend to about 900 acres, have been placed under the control of the College.

2. *Cumberland and Westmorland Farm School, Newton Rigg, Penrith*.—The farm at Newton Rigg comprises 116 acres of good land, three-fourths of which is grass. The primary object of the institution is to provide instruction for pupils of both sexes in the science and practice of agriculture, with special reference to dairy farming. Courses of eight weeks each for female pupils are held from March to October, and of sixteen weeks for male pupils from November to March. The fee for resident pupils from the two counties is 10s. a week for board and tuition.

3. *The University of Leeds*.—Students may attend a general

course of instruction during the winter months, designed without reference to the requirements of any examining body. The complete course extends over three winters, but students may take a one or two winters' course. This leaves the spring and summer free to be devoted to practical work. The fee for the winter course is £10. There is also a summer course from April to June. In the degree course, students are required to pass the matriculation and intermediate examinations as for the ordinary science degree, and do not enter the agricultural department until they begin to work for the final examination. The latter period of study extends over two years, and the fees are about £25 a year. During these two years students are required to spend at least six months on the Manor Farm, Garforth, where each student must conduct an experiment on some agricultural subject, and present a report on the same. The farm at Garforth extends to 280 acres, and affords means of instruction in general farming, dairying, and horticulture.

4. *The Harris Institute, Preston.*—The object of the instruction given at this institute is to prepare young men and women for the work of a farmer's life by enabling them to study the principles which underlie farming operations, while the Lancashire County Council Farm at Hutton is available for practical instruction in dairy farming. The full course extends over four winter sessions of twenty-six weeks each, while there is a shorter course of two sessions.

All students from the administrative county of Lancaster receive their education free, and allowances and scholarships are also given to some in addition. The fee for external students is £15 15s. per session. A diploma in agriculture, as well as a certificate, is awarded, and students are also prepared for the National Diploma.

The County Farm covers 157 acres, mostly grass, and about 100 head of dairy cattle, 80 to 100 pigs, and 800 to 1,000 head of poultry are kept. Permanent dairy and poultry schools are held here, resident students from the county being received free. A diploma in dairying and a teacher's certificate in poultry-keeping are awarded.

5. *College of Agriculture and Horticulture, Holmes Chapel.*—This institution aims at supplying practical training in agriculture

and horticulture. The complete course for the diploma covers three years. The inclusive fees for board and tuition at present are £36 per annum for those resident in the county of Chester and £48 for those outside the county. The farm is a mixed one of about 90 acres, fairly typical of the county ; and a herd of dairy Shorthorns is kept, as well as sheep, pigs, and poultry. For instruction in horticulture there is a garden and fruit plantation, seven acres in area, and extensive ranges of greenhouses.

6. *University College of North Wales, Bangor.*—The College prepares students for the B.Sc. degree (three years' residence after matriculation) or for the college diploma (two years' residence), the fees for which are approximately £15 15s. per session and £5 for practical instruction at the farm. There is a special course of ten weeks during each of the autumn and spring terms for those who find it inconvenient to attend during the summer months, and for these courses a special fee of £5 15s. 6d. per term is charged. The course in forestry covers three terms, and a certificate is granted.

The College farm is situated at Madryn, about six miles from Bangor. In area it covers 660 acres, of which about one-half is arable and pasture land of fair quality and the remainder an upland sheep walk. The stock kept consists of 90 head of cattle, 1,600 sheep and lambs, and 18 horses. Students reside in the neighbourhood for part of the course.

For the purpose of instruction in forestry 50 acres of hill land is being planted, and a "nursery" has also been started.

7. *Midland Agricultural and Dairy College, Kingston, Derby.*—The complete course of instruction in agriculture commences in October, and is divided into three terms, each of ten weeks' duration. The terms are arranged so as to occupy the time between corn harvest and hay harvest, when young men can be most easily spared from the farm. The fee for tuition is £5 per term of ten weeks to students resident in the co-operating counties, and £7 10s. a term for students outside that area.

The course of instruction in dairying is a thoroughly practical one, and such scientific instruction is also given as is necessary to explain the principles on which the practice depends. The teachers' diploma course requires the attendance of students for not less than nine months, and a similar course is arranged

for those requiring a commercial knowledge of dairying and factory management. The fees are £6 for three months, £10 10s. for six months, and £13 10s. for nine months for county students, and double fees for students resident outside the contributing counties. There are six-week courses in dairying, the fee for which is similarly at the rate of 10s. or £1 per week.

The Institute is situated in the centre of its own farm of 170 acres, half of which is under permanent grass and half under arable cultivation.

8. *Harper-Adams Agricultural College, Newport, Salop.*—The diploma course extends over two or three years, and is intended for those who, having done a certain amount of pure science, are able to apply themselves to advanced work. The certificate course also takes two years, but is of a less advanced character, and is intended to provide a training in practical agriculture. The fee is £8 for tuition and about £35 for board and lodging per session of three terms.

Short courses of eight weeks are held during the autumn and spring, the fee for which, including board and lodging, is £10.

The farm is about 180 acres in extent, and the buildings are of a very complete character. A large number of stock are fattened on the farm, and a herd of milking cows and a flock of sheep are kept.

9. *University College of Wales, Aberystwyth.*—The degree course extends over three academic years after matriculation, and the fees are £10 per annum for tuition and £10 for instruction on the farm. The agricultural diploma course also extends over three years, but students are required to attend during the winter and spring terms only, and to spend twenty-four weeks in each of the first two years of their course either on the College farm or on some other approved farm. The tuition fees are £7 10s. for the two terms and £5 for instruction on the farm for twenty-four weeks.

There are also short courses for farmers, intended to provide technical instruction for those who have already some experience of practical agriculture. Part I. extends over eight weeks, for which the fee is £3; Part II. lasts for twelve weeks, and the fee is £3 10s.; Part III. is of a more advanced character, and extends over the winter and spring terms of the subsequent

year, the fee being £7 10s., with an additional charge for practical work.

Courses in dairying, qualifying for a certificate, are held in the summer, lasting eight weeks, for which a fee of £6 is charged; the course for the College diploma in dairying extends over three terms.

The farm is about $4\frac{1}{2}$ miles from Aberystwyth, and consists of about 200 acres of land, of which about 50 acres are arable. A varied assortment of live stock is kept, including Shire horses, Welsh ponies, Shorthorn, Hereford and Welsh cattle, and various breeds of sheep and pigs.

10. *Cambridge University*.—The University grants a diploma in agriculture to those candidates who pass the requisite scientific and practical examinations. The University has also instituted a special examination in agricultural science for the B.A. degree. To obtain the B.A. degree a student in agriculture must reside as a member of the University for three years (nine terms), and must pass (a) the Previous examination; (b) the General examination or Part I. of a Tripos examination; and (c) the Special examination in agricultural science. For members of the University the cost will vary from £100 to £150 a year. For students who do not join the University and are willing to live plainly, the cost need not exceed £60 for twenty-four weeks, including board and residence, and fees for lectures and laboratories.

The farm at Impington, about three miles from Cambridge, is 140 acres in extent, and is used for teaching purposes. Experiments on soils, manures, crops and stock of the usual kind are conducted on this farm and at a number of centres in the adjacent counties. Important researches into the breeding of plants and animals are being carried out in the University Laboratories and at the farm, and facilities for advanced work are offered to students.

11. *The Eastern Counties Dairy Institute, Ipswich*.—Instruction is afforded here in dairying and poultry-keeping. The full course extends in summer from April to October, and in winter from November to March, but students can attend for any period. The fee for a full course of instruction is at the rate of £5 per month. Board and lodging can be obtained for

12s. 6d. a week and upwards. A poultry school, extending over a period of three weeks, is held twice annually at a fee of £3.

12. *The Essex County Technical Laboratories, Chelmsford.*—The principle adopted at this centre is to base the teaching of the sciences fundamental to agriculture on practical laboratory work. Three courses of four to five weeks each are given in the winter and spring in agriculture, chemistry, physics, botany, and zoology. No instruction is given in the actual processes of farm work, it being held that these must be learnt upon the farm itself.

In dairying, the instruction is given in an elementary two-weeks' course, and a more advanced course of six weeks; practical work in the dairy is an important feature in both courses.

In horticulture, four courses of instruction of three to four weeks each are given to young gardeners. The school garden is three acres in extent, and consists partly of botanical plots and partly of fruit, vegetable and flower borders. There are also a number of classes in scientific subjects. County scholarships, entitling holders to free tuition, are given, no fees being charged.

13. *The Bedford Agricultural Institute, Ridgmont, Aspley Guise.*—This institute consists of a good farmhouse with buildings, a small dairy, and a farm of rather over 270 acres. It is open to men in winter and women in summer, and the courses, which last for five weeks each, are designed to afford instruction on sound practical lines to young men and women who cannot take long advanced courses of training at the higher agricultural colleges. For students living in the county of Bedford the fee, including board and lodging, is £2 for the course, and for other students £10. Special arrangements, however, have been made for the admission of students from adjacent counties.

13. *The University College, Reading.*—Separate instruction at this College is given in agriculture, dairying, poultry-keeping and horticulture.

In agriculture, there are two regular courses, one in scientific and practical agriculture extending over two years for the diploma, and a six months' course for the certificate. The fee for the diploma course is £18 per session of three terms, and for the certificate course £12 for two terms. In the case of students

from contributing counties, these fees are reduced to £13 10s. and £9 respectively.

In dairying, two regular courses are provided, one extending over two years for the diploma, and one of three terms (October to July) for the certificate. The fee per session of three terms for the diploma course is £16 (excluding practical work at the British Dairy Institute), and for the certificate £20, reduced in the case of county students to £12 and £17 respectively. There is also a short course in dairying of ten weeks, for which a fee of £10 is charged.

The instruction in poultry-keeping is given at the College Poultry Farm, where courses of five and ten weeks are held, the fee being at the rate of £1 per week. A certificate in aviculture is given to students holding the diploma or certificate in agriculture or dairying who have received theoretical and practical instruction and passed the necessary examinations. Students can also attend at the College Poultry Farm for practical work only.

The work of the department of horticulture consists of lectures and laboratory work in the College and of practical work in the College garden. There are two principal courses of instruction, one for the diploma in horticulture extending over two years, of forty weeks each, and one for the certificate extending over one year.

Excellent facilities are afforded for practical instruction in all these subjects. The College Farm at Shinfield, about two miles from Reading, comprises about 150 acres; about $7\frac{1}{2}$ acres of this is copse or wood, and of the remainder 25 is permanent pasture and the rest arable. Instruction is given here regularly in the afternoons, and students are encouraged to assist in the farm work. The buildings of the British Dairy Institute, which are near the College, are available for practical dairy work. The College Poultry Farm is at Theale, about five miles from Reading, and comprises about 40 acres, mostly meadow land. A large stock of poultry is kept and all modern appliances connected with both natural and artificial methods of hatching, rearing, feeding and fattening are provided. The College garden for instruction in horticulture is $7\frac{1}{2}$ acres in extent and consists of fruit plantation, vegetable and flower gardens, botanic

garden, shrubbery, and paddock. There are good buildings, a large number of pits and frames, and 13 glass houses. In addition, 12 acres of land at the College Farm have been set apart for fruit-growing.

15. *The British Dairy Institute, Reading.*—The British Dairy Institute is under the management of a committee representing the British Dairy Farmers' Association and the Reading College. It contains large milk-receiving, butter-making, and milk-testing rooms, four cheese-making rooms, and seven rooms for ripening cheese. It is equipped with the best modern apparatus for the manufacture of dairy produce. The instruction given is both practical and theoretical, and is arranged to suit the requirements of those who need either elementary or advanced dairy instruction. The fees are £1 per week, £10 for three months, £18 for six months. Practical and theoretical instruction in butter-making only costs 10s. per week.

16. *South-Eastern Agricultural College, Wye, Kent.*—The instruction at this College is arranged in three courses :—(1) The London University B.Sc. agricultural course, extending over four years ; (2) the diploma course, extending over three years ; and (3) the certificate course of two years. The mornings are allotted to lectures and laboratory work, the afternoons are occupied by various practical classes on the farm, the fruit and hop plantations, the dairy, poultry-yard, &c. Lectures are given in the evening.

The inclusive fee for board and tuition is £120 a year ; for tuition only £60 a year ; and for a limited number of students resident in Kent and Surrey £60 a year, including board and lodging. Several scholarships are awarded.

The College Farm consists of about 460 acres, of which 176 are arable and the remainder pasture, gardens, buildings, &c. The sheep kept are chiefly pure-bred Romney Marsh and South-downs, and there is a herd of pedigree Lincoln Red Shorthorns, as well as Aberdeen-Angus, Ayrshires, Jerseys and Guernseys. A hop garden has been laid out, showing different systems of training hops. Fruit-growing receives special attention, and about $7\frac{1}{2}$ acres has been planted within the last few years. A series of demonstration plantations and a nursery for forest

trees is being established to enable practical instruction in Forestry to be given.

17. *Agricultural and Horticultural College, Uckfield, Surrey.*—The courses of instruction here comprise (1) a two years' course qualifying for the College diploma, (2) a twelve weeks' course for farmers' sons during winter, and (3) a course for land agency students from October to March. The fees for students from the county of East Sussex are £16 13s. 4d. per term, but £20 for students outside the county, including board, lodging and tuition. The fees for non-resident students are £10 10s. per term. The farm comprises 101 acres, about equally divided between pasture and arable. A herd of pedigree Jerseys is kept, as well as sheep, pigs and poultry. Bullocks are fattened during the winter.

There is a garden of nearly five acres, of which three acres are planted with fruit and the remainder with vegetables. Special attention is given to horticulture and poultry farming.

18. *The Hampshire Farm School, Basing.*—At this school provision is made for training lads or young men in winter and women in summer. The winter course lasts for twenty-four weeks and is thoroughly practical. Indoor instruction for about one hour is given each morning and afternoon. As regards outdoor work, the lads are divided into four groups, each taking a month at farm work, in the dairy, with the poultry, and in the garden. Once a week they are taken to Basingstoke market. The summer course is designed mainly for women and is divided into three periods of five weeks each. It is largely devoted to dairying. The fees for pupils from Hampshire are 10s. per week, and for other pupils £1 per week, including board, lodging and tuition. The farm consists of 61 acres, of which rather more than one-half is arable; there is a specially built dairy and a garden of about $1\frac{1}{2}$ acres.

19. *National Fruit and Cider Institute.*—The Institute is situated at Long Ashton, near Bristol, and occupies some 15 acres of land. About two-thirds of the area is occupied by orchards, about one acre is used as a nursery, and two acres as a fruit plantation. Students are received for scientific instruction in the laboratory at a charge of four guineas for one month's instruction and ten guineas for three months. Working pupils

from subscribing counties can be received at the Institute for a period of not less than one year for instruction in fruit-growing. Such pupils will receive 7s. 6d. per week.

All the above institutions receive grants from the Board, and are also supported by their respective County Councils. With reference to the fees which are mentioned, it must be remembered that advantages are usually given to students from contributing counties, frequently in the form of reduced fees, and also by means of scholarships.

OTHER INSTITUTIONS.

In order to make this account of the facilities for agricultural education in England complete, reference must also be made to several other institutions of a semi-public character which do not receive grants from the Board, and also to the local work of the County Councils.

Among the institutions not receiving grants from the Board may be mentioned:—

The Royal Agricultural College, Cirencester.—This institution was founded by Royal Charter in 1845, and is intended to provide a course of instruction, both scientific and practical, suitable for agriculturists, landowners, land agents, &c. It possesses a farm of 500 acres, and its prize live stock are well known. An area of 3,000 acres of woods, the property of Lord Bathurst, is available for instruction in forestry. The entire course covers two years (six or seven terms), but there is a special one-year course. The fees for in-students are £45 per term of about eleven weeks, and for out-students £25 per term for tuition only.

The Agricultural College, Aspatria.—The course covers two years, and forms a suitable preparation for the National Diploma in agriculture and similar examinations. Arrangements are made with farmers in the vicinity for practical work. The fees are £31 10s. per term of twelve weeks, including board, lodging and tuition.

The Horticultural College, Swanley, Kent.—This College aims chiefly at giving a thoroughly systematic training to women who wish to become market-growers and gardeners, or teachers lecturers, &c. The full diploma course extends over two to three years. The fees are £80 a year of about 39 weeks, in-

cluding board, lodging, and tuition, or £40 a year for tuition only. The College stands in 43 acres of land, divided into 2 acres of flower garden, 12 of kitchen and market garden, and 17 of fruit plantation, the remainder being meadow, &c. There are 15 large glass houses.

There are also certain private institutions giving instruction in agriculture, dairying &c., such as the Lady Warwick College, Studley Castle, Warwick, as well as several secondary schools, such as the Countess of Warwick's School at Bigods Hall, Dunmow, Essex, the Shepton Mallet Grammar School, the Brewood Grammar School, the Cambridge and County School, and the Dauntsey Agricultural School, to which reference is made below.

COUNTY WORK.

Most of the counties of England and Wales provide agricultural education in one form or another out of the funds provided by the Local Taxation (Customs and Excise) Act, 1890, the exceptions during the past year being Lincs. (Holland), the Soke of Peterborough, and West Sussex. In some cases the work is carried on by the county through a permanent official staff of instructors, and in others through one of the colleges to whose funds it contributes.

In addition to the colleges and farm schools to which reference has already been made there are several local institutions of a somewhat analogous character, which are maintained by certain counties for instruction in agriculture, dairying, &c.

1. *The County Council Farm, Hutton, Lancs.*—This farm, which has already been referred to in connection with the Harris Institute, is maintained as a fixed dairy and poultry school, and is situated about three miles from Preston. Five junior courses lasting eight weeks each, and one advanced course lasting twelve weeks are held each year, and in addition one course is held for students taking the examination for the National Diploma in dairying. Eight and twelve-week courses in poultry-keeping are also given.

2. *Worleston Dairy Institute, Cheshire.*—This is a permanent dairy school maintained by the County, at which three courses are held annually, each of fifteen weeks' duration.

3. *Lleweni Hall Dairy School, Denbigh.*—This school is main-

tained by the counties of Flint and Denbigh, in conjunction with the University College at Bangor. The school is open for private pupils all the year round, and courses of six weeks' duration are held from time to time.

4. *The Dairy School, Garforth, Leeds.*—This is maintained by the three Ridings of Yorks on the farm which is worked in connection with the University of Leeds. Three courses of six weeks' duration are usually held during the summer and poultry lectures are also given.

5. *Fixed Dairy School, Monmouth.*—A fixed dairy school is arranged for at a farm in various parts of this county each year, and pupils are taught the principles of cheese-making and dairy management.

6. *Dairy School, Warwick.*—A fixed school is maintained by the county during the summer season, at which three courses of eight weeks each were held last year.

7. *Fixed Cheese School, Somerset.*—A cheese school, maintained by the county, is held on a different farm each year from April to October. Pupils are taken for any period, the full course being four weeks.

8. *Gloucester Fixed Dairy School.*—A fixed dairy school is maintained throughout the year. Short courses are given, and they are arranged to extend over a longer or shorter period according to the number of days pupils can attend.

9. *The Dauntsey Agricultural School, West Lavington, Wilts.*—This endowed school is carried on under a scheme approved by the Charity Commissioners as a secondary school, where, in addition to the usual subjects included in a commercial education, instruction both theoretical and practical is given in all branches of knowledge pertaining to farming. The school stands in about 15 acres of land, and the fees are £6 per annum for day boys, and for boarders £30 for foundation boys and £40 for other boys.

County Lectures and other Methods of Instruction.—With regard to the general county work, it may be said that lectures and instruction in agriculture, dairying, poultry-keeping, bee-keeping, farm hygiene, farriery, manual processes, and horticulture are given in a large number of counties.

The instruction in dairying may be given at a fixed dairy

school, or by means of a migratory dairy school, which visits a number of different centres each season. A similar system is adopted with farriery.

A number of counties carry out field experiments or demonstrations, and many have school gardens attached to day or evening schools. In the same way many have fruit-growing stations, demonstration gardens, or trial allotments.

Full information respecting the work carried on in each county will be found in the Board's Annual Report on Agricultural Education (*Cd.* 3,317, price 10d.), to which reference should be made for further particulars.

THE PRUNING OF NEWLY-PLANTED FRUIT TREES.

There are certain points in connection with fruit which seem irrevocably bound up with controversy, and the reason is that by following what appear to be exactly opposite courses, results are secured in each case which are claimed to be equally satisfactory. The early pruning of newly-planted trees may be taken as an example.

As a rule the trade cultivators look coldly on the pruning of young trees fresh from their professional hands, and in view of their training and experience, their opinion is entitled to respect. But it may, nevertheless, be misleading, for it must be remembered that the fruit nurseryman devotes himself to the raising of young trees which are subjected to one uniform routine. He propagates or buys stocks, buds or grafts them, grows the trees for three or four years, and then sells them. In very few instances has he the same intimate knowledge of trees six years old and upwards that he has of trees half that age.

The shifting of young trees of saleable size in nurseries is generally of annual occurrence. The varieties are grown in separate blocks or "breaks," and when the sale season ends there are gaps in every block indicating where plants have been removed for the execution of orders. A closing-up process follows.

The unsold trees are lifted and planted in rows in another place so as to form a fresh block. The trees suffer no vicissitudes in transit, as trees often do which are sent a considerable distance by rail; they are handled by skilled men, so that they sustain no serious loss of roots; they are planted in specially-chosen and specially-prepared fruit soil; and—most important of all—they are planted late in the season. These trees will probably not grow vigorously, but form fruit spurs, and be sold off the following season as “transplanted fruiting trees,” and the nurseryman is consequently led to the conclusion that in the ordinary course of things transplantation is advantageous, and regards heading back after transplanting as a useless mutilation of his handiwork.

While it may fairly be conceded that in any matter concerning fruit stocks and the early training of young trees the opinion of experienced nurserymen should carry special weight, the experience of large market growers and of private cultivators on a large scale is entitled to a preponderating influence as regards the treatment of older trees. These classes plant for permanency, and have particular trees under their observation for a great many years, so that the progress of individual specimens, or sets of trees, can be observed over a series of years with greater accuracy than would be possible in the case of a number of young trees which have been shifted from place to place in a nursery. Moreover, as fruit trees are grown for fruit, the ultimate test of the efficacy of any course of treatment must be the quantity of good fruit which a tree yields over a series of years, and it is with established trees in field and garden rather than with young trees in the nursery that we find ourselves in the best position to make appropriate comparisons.

On the whole, the attitude of private and market growers as a body towards the pruning of newly-planted fruit trees may be said to be favourable, except in the case of trees planted, not in autumn, but in spring.

The question for consideration, then, is whether newly-planted fruit trees should be pruned directly they are planted, or whether they should be left uncut for a year. The point is an important one, for it is on the manipulation of a tree in its early years that its ultimate success depends. Early neglect is bad economy, in

that it leads to a loss of crop, and entails extra labour in later years ; it means in the first place a sacrifice of income, and in the second increased expenditure. The fruit grower is wise who resolves to shape his trees with care in their early days, and thus avoid the ill-shapen and overcrowded specimens that are often met with. The question of increased labour is equally important with that of loss of crop. A tree that is carefully shaped at the outset can be pruned in after years with ease and rapidity ; a neglected tree makes pruning troublesome and slow.

When a fruit tree is lifted in a nursery in the execution of an order it is, in theory, taken up with care and deliberation by a body of picked men, who retain all the fibrous roots and handle it with caution, so that neither branches nor root-stock are injured, but it is inevitable that it should lose a great many roots, and since the loss of fibres must destroy the balance between root and head, it is wise to ask whether it ought not to be restored by reducing the branches to correspond with the reduction of the roots. One reason apart from theory is that the check consequent on shifting and loss of fibres will often throw a young tree into fruiting. Buds on the upper parts of the young branches (if these are left) become developed into fruit buds. They bloom, the fruit sets, and the inexperienced grower congratulates himself on getting a crop so soon. His satisfaction, however, is short lived, as the tree is too poorly rooted to develop a crop and make growth at the same time. The unpruned shoots are consequently dragged down by the weight of the fruit, the shape of the tree is lost, and the successional growth is scanty.

This prevention of premature fruiting is a strong reason in favour of pruning after planting. It confines the trees to one duty, and one only—that of making growth, which is the best task a tree can engage in during its first year in the permanent plantation. If a tree is crippled through fruiting too soon, whatever return the crop yields will be dearly bought. The position of the market grower differs in this respect from that of the exhibitor. A few fruits are of no particular use to the farmer who wants bulk ; whereas they may be of great importance to an exhibitor for making up prize dishes.

Two things are necessary to make a market tree remunerative ;

the one is good soil, the other is a wide, open head of branches, capable of carrying a considerable quantity of fruit. Early pruning after planting will not compensate for bad soil—nothing can do that—but it will supplement it. It will encourage the lower buds to break strongly, and if the knife is put through just above an outer bud, a new leader will push, the direction of which is away from the centre of the tree and into the free air, where it can extend without interfering with its neighbours. "Upwards and outwards" should be the pruner's motto.

What the nurseryman calls a "transplanted fruiting bush or pyramid" will probably be three to five years old, and have fruit spurs on the lower parts of the main branches. It would certainly be a pity to cut such trees hard back to the main stem, but the leading shoots should be shortened (cutting in all cases to a bud on the outside), the breastwood or laterals pruned in, and if the tree blooms and sets a crop, the fruits severely thinned. Untransplanted standards should be treated still more drastically, the leaders being shortened to a quarter of their original length.

It has been mentioned that an exception to the rule of pruning after planting may be made in the case of trees planted in the spring. Careful observers have noted that where trees planted in spring have been pruned at once they have broken into growth very badly. This has been specially observable if the weather has been bleak following the pruning. In what are called the "late districts" of Kent—that is, on the strong soils of the Weald—growers are almost unanimous in agreeing that if a fruit tree is not planted until the spring the cutting back should be deferred to the following season, though if planted in autumn it should be promptly pruned.

That spring-planted trees do break badly if subjected to the knife immediately they are put in may be accepted as a fact, but the reason for this is not altogether clear, and the following suggestion must be taken for what it is worth. The first active movement of the sap in spring carries it past the lower buds (that is, those nearest to the roots) to the upper ones. That it does concentrate near the tips rather than near the base of the shoots is certain, because the top buds always start to grow long before the bottom ones. If the shoots are

cut back at the time the upper buds are swelling under the influence of this sap flow, and before the leaves have opened to encourage root action, the sap stream is checked, and there is only a very weak action on the lower buds. Matters would right themselves if genial weather prevailed, but if cold winds come in April and May instead of warm rains, the movement is sluggish, and the consequent growth slow.

Admitting that there is a weak concentration of sap on the lower buds at the time the upper ones are swelling, there should certainly be a much stronger concentration when the upper buds have broken into growth and started that reciprocating action which exists between leaf and root. Consequently it should be advantageous to prune, not while the shoots are practically dormant, but after the upper part is in full motion. This theory is supported by practical results. Spring-planted trees that are pruned while nearly dormant are quite likely to start badly, while trees left until growth is breaking freely and then pruned will go ahead well. The importance of the point will be realized when it is seen that by a slight modification of practice which involves no extra expenditure, a season's growth may be gained.

To sum up, I consider that it is to the advantage of fruit growers to shape their trees carefully in their early years with a view to extending the fruiting area, and saving much cutting in the future. It is important to prune the trees hard the same season that they are planted, distinguishing, however, between autumn and spring-planted trees to this extent, that the autumn-planted trees should be pruned as soon as possible after they are put in, while the pruning of the spring-planted ones should be deferred until the upper buds have broken well into growth.

If the fruit grower is also a rose grower he will be the more ready to accept my conclusions, because he will have observed that when roses which have started early are pruned back they universally break strongly. If the upper buds are in full leaf before the lower ones, to which the pruning is eventually done, start at all, the latter are all the stronger when their time comes.

WALTER P. WRIGHT.

BIRDS AND FRUIT GROWERS.

There is general agreement among fruit growers that the number of wild birds has greatly increased in recent years, seriously to their injury. Evidence to this effect was brought before the Departmental Committee on the Fruit Industry, and the Committee, in their Report, state that "there can be no doubt that this grievance is well founded. The destruction of all vermin in country districts, the curtailment of the area of cultivation, and the protection afforded to wild birds by recent legislation, have upset the balance of Nature, so to speak, with the result that they have multiplied to such an extent as to become a positive pest in some places." To these causes may be added a succession of generally mild winters, and the withdrawal from work on farms of boys of school age.

If the uncompromising apologists for birds were right in declaring that all varieties do more good than harm, a great reduction in the attacks of injurious insects would have resulted from the increase in the number of their feathered destroyers. Unfortunately, this is far from being the case, as insect pests have increased simultaneously with the multiplication of birds, in spite of the growing practice of spraying.

With respect to the effect of the Wild Birds Protection Acts in preserving birds injurious to fruit growers, the Committee give good reasons for concluding that it is indirect rather than direct. It is pointed out that the birds scheduled in the Acts are chiefly rare varieties, not including bullfinches, sparrows, blackbirds, thrushes, and starlings; and that, according to the general law, owners and occupiers of land may kill all but scheduled birds or take their eggs at any period of the year, although outsiders are prohibited from such action during the close period. But it is further remarked that the Home Secretary, on the initiative of a County Council, may extend or vary the close time as to any or all wild birds, and may add to the schedule, thus depriving owners and occupiers of the right to kill destructive birds in the close season.

It is concluded that the fruit grower has no legitimate griev-

ance against the general law, and that if a destructive bird has been added to the schedule of his county, so that he cannot kill it in the close time, he should seek redress from the County Council. But as evidence brought before the Committee indicated that most growers are unaware of their right of destroying non-scheduled birds and eggs in the close time, it is recommended that the rights of owners and occupiers of land should be explicitly stated in Orders issued by County Councils.

Having obtained a dozen local Orders as samples, without any selection, I find that the bullfinch is protected in two of them during the entire year, while the thrush, the chaffinch, and the stock dove—birds which many fruit growers declare to require thinning—are scheduled in others. Moreover, it is important to observe that the Orders issued by local authorities frighten the boys of our villages from bird-nesting altogether, even when there is no prohibition. In a paper on "Fruit Growing and Bird Protection," read recently before the Society of Arts by Mr. Cecil H. Hooper, it is stated that even in parts of Kent, a great fruit county, all wild birds' eggs are protected; also that where this is not the case, he believes that school children fancy they are prohibited from taking any birds' eggs. A village policeman whom he consulted said that he stopped boys altogether from taking eggs.

It would be well if a consensus of opinion could be obtained from fruit growers as to the birds which need a great reduction in number. Probably they would be nearly unanimous in desiring to withdraw protection from the sparrow, the bullfinch, and the blackbird, as their most inveterate enemies; while a great majority would add other birds to the list of varieties needing thinning. The song thrush, though at least as destructive as the blackbird to soft fruit is much less so to apples, and is, moreover, a great eater of snails and a destroyer of insects and grubs of various kinds throughout the greater part of the year. The missel thrush, according to Mr. Hooper, is considered by Kentish growers one of the worst birds for fruit. Both kinds of thrush, and particularly the song thrush, are far too numerous.

Probably no fruit-grower would have a word to say in favour of the sparrow or the bullfinch, while not many apologists could be found for the blackbird. In my opinion the greater part of

the disbudding of gooseberries, currants, plums, and cherries, is done by sparrows, because the devastation is often so speedy and extensive that other bud-eating birds are not numerous enough to account for the whole of it. The sparrow and the chaffinch are further charged with squeezing the blossom of cherries, plums, gooseberries, and currants to extract honey from them. The chaffinch, however, according to Mr. Hooper, is also a destroyer of caterpillars and the woolly aphis, and therefore it is not to be placed in the worst class of birds with the sparrow and the bullfinch, though it can hardly be said to deserve protection.

Last season a small plantation of gooseberries close to my homestead, where sparrows abound, was almost entirely ruined, the crop being only about one-tenth of what it should have been, in consequence of disbudding. This loss of a year's crop, moreover, was not by any means all the damage; for many of the bushes had to be cut back to mere stumps, because the branches had been almost entirely denuded of buds, rendering them permanently barren. In a plantation of eight acres, too, the crop of gooseberries was more than half destroyed on fully an acre on the outsides, convenient for birds harboured in the hedges, while much damage was also done to the interior of the field. The bushes had been sprayed with a protecting mixture, which was effective until persistent rain had washed it off. Then, in two or three days, during which inspection of the plantation had been neglected, the damage was done. A second spraying was then carried out, which checked, if it did not absolutely prevent, further devastation. In the same season plum trees on the hedge sides of a plantation had both fruit and leaf buds picked off to a serious extent, nearly all the young shoots being stripped, so that they had to be cut off at their bases. Further, sixteen fine trees of such choice varieties as Old Greengage, Coe's Golden Drop, Denniston's Superb Gage, Oullin's Golden Gage, Reine Claude Violette, and Early Transparent Gage, covered with fruit spurs, had their fruit buds so generally picked off by birds that the whole of them did not show fifty blossoms.

Such examples of injury, which nearly every grower of fruit on a considerable scale could match, may fairly be regarded as sufficient indictments to justify the unrestricted destruction of sparrows and bullfinches, and the thinning of chaffinches and green

linnets. Fruit-devouring birds are bad enough ; but bud-eaters are far more wholesale destroyers of fruit crops.

Some lovers of birds may raise the objection that bud-eating may be prevented by spraying. Possibly this may be the case where a grower is prepared to spray any number of times in a season that may be necessary. In a rainy winter, however, the spray-stuff may be washed off several times ; and it may happen that severe frost, snow, or persistently wet weather will prevent spraying immediately after the trees and bushes have been denuded of their protective coating.

In this *Journal* for February, 1905, an effective wash was described, consisting of 200 lb. of lime, 50 lb. of flowers of sulphur, and 75 lb. of soft soap in 150 gallons of water. It was remarked, however, that although the sulphur was sprinkled over layers of lime during the process of slaking, the soft soap, separately dissolved, being added afterwards, the mixture clogged the nozzles of the spraying machine frequently. Consequently a mixture of potassium sulphide and soft soap was also tried in 1905, with one or two other mixtures. In that season, however, for some unaccountable reason, gooseberries and plums in the place of trial were not disbudded by birds, whether sprayed or not sprayed. Therefore the trials were useless. Last winter a mixture which sprays easily was used, and it stuck to the bushes well, until rain, coming on three days out of four for about five weeks, had washed it off, and extensive disbudding took place, after which a second operation prevented further noticeable damage.

The ingredients of this wash are 60 lb. of quicklime, 30 lb. of flowers of sulphur, 12 lb. of caustic soda, and 10 lb. of soft soap to 100 gallons of water. The method of mixing, which it is important to follow, is:—Mix the sulphur into a paste, beating it up well while somewhat stiff, and gradually thinning it, and pour it over the lime. Stir the ingredients thoroughly until the lime is slaked, adding only as much water as is necessary to allow of stirring. Then add the caustic soda, and stir it in until the renewed boiling action which it sets up is finished. Dissolve the soft soap separately by boiling it in two or three gallons of water, and stir it well in with the other ingredients of the wash, afterwards adding enough water to

make up 100 gallons, and passing the mixture through a strainer of fine brass wire gauze. It is important to obtain lime of the best quality, and freshly burnt.

It is further to be observed that in spraying trees and bushes to prevent bud-eating the usual caution against applying the wash otherwise than in a very fine spray, applicable to the operation when trees are in leaf, does not apply. On the contrary, sprayings should be done so freely that the trees or bushes will be as well coated as if they had been whitewashed with a brush. As the buds are smooth, they are less easily coated than the branches, and a slight spraying does not cover them sufficiently.

The chief object of including soft soap in the mixture is that of making the stuff stick on the trees and bushes. A trial with a little linseed oil proved that it was less effective for the purpose named than soft soap.

As the spinning of a web of fine cotton over gooseberry bushes by means of a convenient tool known as Royle's threader is often recommended, it seems desirable to repeat the statement made in the article mentioned above, to the effect that the plan proved a complete failure with me in the winter of 1903-4.

The period of the year when it is necessary to spray to prevent bud-eating varies with the kind of fruit, with the season, and with the situation of the plantation. Gooseberries are usually attacked sooner than plums, and, in my own experience, the former are disbudded near the homestead sooner than those which are further from the principal haunts of the house sparrow. In a mild winter little or no damage is done before the buds begin to swell ; but in severe weather birds, from lack of other food, may begin the attack prematurely. Except near the homestead, I have not noticed an attack before the New Year has begun ; but in that exceptional situation it has been commenced in or before the last week in December. This season, for example, disbudded gooseberry bushes were noticed near the homestead on the 19th of December, and spraying, therefore, was done on the 20th. In a distant field, however, the gooseberries were not touched by birds before January 17 ; nor could any case of the disbudding of plums be found up to the end of the month. Some families of bullfinches were on the

farm before the middle of December, and they were much more numerous at a distance from the homestead than near it, for which reason the early attack in the latter situation is attributed mainly, if not entirely, to the sparrows. Mr. Hooper states that the worst time of bud-eating is the beginning of March, and with respect to plums it has been found so in my experience. It is important, however, to inspect plantations daily, or nearly every day, after the middle of December, in order to be able to spray at once on noticing the starting of an attack.

Both Mr. Hooper and also Mr. Smith, in a paper read before the Maidstone Farmers' Club, mention apples as subject to dis-budding by birds, and the latter includes black currants; but in my own plantations no evidence of either attack has been noticed. That cherries and pears are attacked there is no doubt, although my few cherry and pear trees, if disbudded at all, have never been sufficiently damaged to prevent profuse blossoming. Some standard peaches and nectarines, grown in the open by way of experiment, however, were disbudded badly last winter for the first time.

Turning to fruit-eating birds, there is no need for hesitation in declaring the blackbird to be the worst offender. This bird is omnivorous in respect of fruit, while it is very numerous, and also one of the slyest of birds. If scared off a field, it simply retires to a sheltering hedge until the scarer has passed by, and is soon out again at its work of depredation. The starling is as bad for cherries, and the thrush for all soft fruits; but both are more easy to shoot than the blackbird is, and can present more mitigating merits as destroyers of noxious insects and grubs. Neither trouble me in apple plantations, and the starling is not conspicuous, if present at all, among the numerous varieties of birds that attack my black currants. But both thrushes and starlings have become far too numerous in most parts of England, or at any rate in the southern half of the country, and need to be thinned, distressful though it is to kill either, and particularly the starling, a very valuable bird when fruit is not ripe. In consequence of the great numbers of blackbirds and thrushes, it is a common experience to be compelled to net every currant and gooseberry bush in a garden, if any ripe fruit is to be obtained, and in many cases strawberry beds and raspberry canes

have also to be protected. As for cherries, the numerous birds that prey upon them must be kept off the trees as far as possible early and late every day after ripening has begun, if any fruit is to be secured. As this is out of the question where only a few trees are grown for private use, birds eat more than half the cherries in many cases. Mr. F. Smith, in the paper already referred to, said that he had trapped over a thousand blackbirds and thrushes per annum for years past, and that he would need to kill double the number to keep these birds at all within bounds in 1906-7, in his 200 acres of plantations. His men also shot 285 bullfinches in the winter of 1905-6.

The tits do some damage by pecking holes in apples and pears ; but experience last season showed the advantage of growing clumps of sunflowers, as recommended by Mr. F. Smith, in various parts of fruit plantations. These birds, and probably many others, are so fond of sunflower seed that they partially neglect fruit in its favour. They are valuable in orchards and gardens as devourers of various injurious insects, larvæ, and eggs. Wood pigeons, doves, and missel thrushes come in flocks to prey upon black currants, and the two former are charged with thefts of gooseberries on a wholesale scale. Rooks, of course, in the neighbourhood of rookeries, are troublesome to fruit-growers, but can be kept off the plantations by scaring more easily than smaller birds, which retire to hedges when frightened.

WILLIAM E. BEAR.

The Board of Agriculture and Fisheries have issued the following Circulars, addressed to Local Authorities having jurisdiction under the Act, dated December 31st, 1906:—

**Circulars
Relating to the
Fertilisers
and Feeding
Stuffs Act.**

**THE ADMINISTRATION OF THE FERTI-
LISERS AND FEEDING STUFFS
ACT, 1906.**

[6 EDW. 7, CH. 27].

SIR,—The Board of Agriculture and Fisheries desire me to bring under the notice of your Local Authority the provisions of the Fertilisers and Feeding Stuffs Act, 1906, which on the 1st January will supersede the Act of

1893, and to offer certain suggestions as to its administration for the consideration of your Local Authority.

The principal amendments of the law affected by the new Act are :—

1. The actual percentages, and not merely the minimum percentages, of nitrogen, phosphates, and potash must be stated in the invoices of fertilisers.

2. The Act applies to sales of fertilisers, however small the quantity sold.

3. Statements of the percentages of chemical and other ingredients in fertilisers, whether contained in the invoice or in an advertisement or circular descriptive of the article will have effect as warranties.

4. In case of any feeding stuff artificially prepared otherwise than by being mixed, broken, ground, or chopped, the invoice must state the percentages of oils and albuminoids.

5. Provision is made for analysis by the Official Agricultural Analyst of samples taken without any communication of the fact to the seller.

6. Local Authorities are authorised to appoint Official Samplers who, at the expense of the Local Authority, can take samples of any fertiliser or feeding stuff without the consent of the owner.

7. Provision is made to secure sellers from unreasonable prosecutions, and for prescribing by Regulation the "limits of error" within which they will be free from civil liability in respect of the statutory warranty arising from the statement of percentages contained in invoices.

8. The Act applies to foods for poultry as well as foods for cattle, sheep, goats, swine, and horses.

CIVIL LIABILITY OF SELLERS.

In order that the provisions relating to the civil liability of sellers may be made operative, it will be desirable that Officers of the Local Authority should inquire, as opportunity offers, as to the character of the invoices given by sellers of fertilisers and feeding stuffs delivered within their districts. If any failure to give the invoice required by the Act is brought under the notice of the Local Authority, the attention of the seller might

be called in the first place to the requirements of the Act, and in the event of his persistently refusing or neglecting to give such invoice, the Local Authority should communicate with the Board of Agriculture and Fisheries with a view to the consideration of the question whether proceedings should be instituted.

PREVENTION OF FRAUD.

In view of the provisions of the Act relating to criminal procedure, Local Authorities should institute inquiries with a view to ascertain whether any fraud exists within their districts in connection with the sale of fertilisers or feeding stuffs.

For this purpose all reasonable facilities for having samples analysed by the Agricultural Analyst should be given to purchasers. The fee payable by purchasers who send samples to the Agricultural Analyst is to be fixed by the Local Authority ; and the Board think that the importance of ascertaining the character of the trade carried on in their district would justify a Local Authority in arranging that for a specified period purchasers may send samples to the Agricultural Analyst free of charge.

But however great the facilities that are given for analysis, it is not likely that the poorer and less educated buyers, or those who purchase manures and feeding stuffs in small quantities, will send any considerable number of samples to the Analyst. In order to ascertain whether traders who supply such persons are dealing fraudulently, it will be necessary that the Official Sampler should take the initiative in procuring samples of the articles supplied to them. Such persons will not readily co-operate with the Official Sampler unless the sampling is carried out without the knowledge of the seller ; and it will therefore generally be necessary in these cases to take samples without communication of the fact to the seller.

The Act provides (Sec. 3 (4) (b)) that Agricultural Analysts shall report to the Board in the prescribed manner the results of analyses of samples which have been divided into three parts, of which two are sent to the Agricultural Analyst and one to the seller ; but it does not oblige the Agricultural Analyst to report on other samples. It would therefore seem desirable that arrangements should be made with Agricultural Analysts by

Local Authorities for reports to them on all other samples analysed under the Act, similar to the provision made in the Fertilisers and Feeding Stuffs (General) Regulations, 1906, for reports to the Board of the samples above referred to, and the Board would be glad to receive copies of these reports. The Board believe that if any considerable number of these samples are taken without the knowledge of the seller, the collection and tabulation of information regarding such samples will be of material assistance to them in considering any question as to prosecution which may come before them, and will enable them to co-operate effectively with Local Authorities in obtaining the evidence necessary to secure convictions against sellers who are found to be carrying on a fraudulent trade.

In cases where the Local Authority have reason to believe that a seller is carrying on a fraudulent trade they should instruct an Official Sampler to procure a sample with a view to criminal proceedings. The powers conferred by the Act (ss. 3 (2) and 8) on Official Samplers with regard to sampling articles which have been sold or are exposed or kept for sale as fertilisers or as foods for cattle or poultry will probably be found sufficient to enable them to take the necessary sample, which should not only be divided and dealt with in the prescribed manner, but should be taken in accordance with the Fertilisers and Feeding Stuffs (Sampling, &c.) Regulations.

On receipt of a communication from an Official Sampler who intends to take a sample with a view to a prosecution, the Board of Agriculture and Fisheries will be glad to instruct one of their Inspectors to confer with him and give him any information in their possession with regard to the seller of the article in question which may be of assistance to him.

SAMPLING BY OFFICIAL SAMPLERS.

The Act (s. 3 (2)) provides that the Official Sampler shall at the request of the purchaser, and on payment by him of the required fee, take a sample for analysis by the Agricultural Analyst. If an Official Sampler were frequently called upon to take samples of articles supplied by firms of good repute, much time might be wasted and useless expense incurred, and it will probably be necessary for this reason to fix at a considerable

sum the fee payable where the services of an Official Sampler are called for by a purchaser. But the Board desire to point out the desirability of making it widely known that the Local Authority would welcome information as to the delivery of purchases of fertilisers and feeding stuffs so that the Official Sampler may, in cases where he thinks action might be useful, take samples on behalf of the Local Authority which would entail no expense on the purchaser. This fact, and the names and addresses of the Official Agricultural Analyst and the Official Samplers, might with advantage be advertised from time to time.

I am, Sir, your obedient Servant,

T. H. ELLIOTT, *Secretary*.

SIR,—I am directed by the Board of Agriculture and Fisheries to inform you that, in pursuance of the provisions of the above Act, they have made and issued three sets of Regulations,* copies of which are enclosed. These Regulations take effect from the 1st of January, 1907, from which date the Regulations (made under the Act of 1893) previously in force are revoked.

These Regulations comprise:—1. Fertilisers and Feeding Stuff (Sampling, &c.) Regulations, 1906; 2. Fertilisers and Feeding Stuff (General) Regulations, 1906; 3. Fertilisers and Feeding Stuff (Limits of Error) Regulations, 1906.

I. FERTILISERS AND FEEDING STUFFS (SAMPLING, &C.)
REGULATIONS, 1906.

It may be pointed out that, of these Regulations, No. 4 and 5, which refer to the sending of invoices, or copies thereof, to the Analyst, apply in all cases in which it is desired to exercise the statutory power, given by Section 3 of the Act, of obtaining an official analysis, whereas the provisions of Regulation 6, both as to notice to the seller and as to the manner of taking samples, apply only in cases in which for certain purposes of the Act the sample is required to be taken in strict accordance with the Regulations.

It will be observed that these Regulations do not differ to any great extent from the revised sampling Regulations of 1897. A few alterations were necessary in consequence of the

* See *Journal*, January, 1907, p. 604.

amendment of the Law. The Act of 1893 required three samples to be taken (Section 5 (2)), but under the Act of 1906 one sample will be taken, and it will in certain cases be divided into three parts (Section 3 (3)). This being the case, and in view of the importance of obtaining a fair representative sample, the weight of the sample to be taken has, as a rule, been trebled. The number of cakes to be taken in sampling a consignment of cake has also been somewhat increased so as to ensure that a fair sample shall be taken.

It has been considered desirable to prescribe the part of the invoice which is to be sent to the Chief Analyst or to the Agricultural Analyst, where the purchaser is unwilling to supply a copy of the invoice as a whole (Section 3 (7)), and the purchaser has been empowered to omit from the copy all details which would disclose the name or identity of the vendor.

Some alterations have been introduced for the purpose of making the Regulations more easily understood, or of facilitating the taking of a fair sample, but they deal with the details rather than with the principle of sampling. It will be noted in Regulation 6 (b) (v) that where a sampling pale or spear is used, the pale or spear is to be passed into the mouth of the bag in order to avoid damage to the bag. It will also be noted that Regulation 6 (b) (ix) provides that if on the delivery of a consignment of a feeding stuff any portion is found to be unsuitable for feeding purposes, an estimate of the proportion of the unsuitable portion is to be made by the person taking the sample, and communicated by him to the Analyst.

A new provision (No. 6 (b) (xi)) has been framed to meet cases where the quantity purchased is small, so that it would be impracticable to take a sample in accordance with the Regulations applicable to larger quantities.

Where Regulation 6 applies, that is, where the sample is required to be taken in strict accordance with the Regulations, the person taking the sample is to give three days' notice in writing of his intention to take it, in order that the seller may arrange to be present if he so desires.

The Regulations include the provision in the Regulations of 1897 of the appointment of an agent by the purchaser to act on his behalf for the purpose of obtaining an official analysis.

2. FERTILISERS AND FEEDING STUFFS (GENERAL) REGULATIONS, 1906.

These Regulations deal chiefly with the duties and work of the Agricultural Analysts.

Under the Act of 1893 the samples might in some cases be taken by the Analyst himself, and it was thought convenient to have distinct forms of certificate for such cases. Under the new Act it seems sufficient to provide two forms, one applicable to fertilisers and the other to feeding stuffs. These Forms differ very little from those prescribed under the Act of 1893. Form A is so framed that the Analyst may, in his discretion, state in the certificate the amount of ammonia to which the amount of nitrogen stated in the certificate is equivalent.

With reference to the reports which, under Section 3 (4) (b) of the Act, Agricultural Analysts are required to make to the Board of the results of analyses, it is required that quarterly reports shall be sent to the Board in ordinary cases, but that the Analyst shall report forthwith the result of his analysis in any case in which any provision of the Act appears to him to have been infringed. A specimen form for these reports is enclosed herewith, and the Board would be glad if your Local Authority would, for the sake of uniformity and convenience of tabulation, print or use forms similar to this specimen.

As regards the phosphates which are insoluble in water (*e.g.*, basic slag and basic superphosphate), but which are stated in an invoice to be soluble to a specified extent in a solution of citric acid (Section 10 (1)), the degree of solubility is to be ascertained by shaking 5 grams of the finely powdered phosphate with 500 cubic centimetres of water containing 10 grams of citric acid in solution in a flask or bottle of about 1 litre capacity for the period of half an hour at the ordinary temperature, and thereafter determining how much of the phosphoric acid passes into solution (see Regulation 5).

3. FERTILISERS AND FEEDING STUFFS (LIMITS OF ERROR) REGULATIONS, 1906.

These Regulations deal with the limits within which the statements made in an invoice as to certain constituents are to operate as a warranty under Section 1, Sub-sections (1)

and (2), of the Act, in the case of fertilisers and feeding stuffs as therein defined. Considerable care has been exercised to ensure that these limits shall provide for the natural variations of the articles, as well as for possible errors incidental to sampling and analysis.

In the Schedules both fertilisers and feeding stuffs have been grouped as far as possible for the purpose of these limits, and the limits vary in proportion to the ability of the manufacturer or vendor to control the quality of the article sold.

With reference to the first schedule it may be noted that, inasmuch as the percentage of soluble phosphate present in dissolved vitriolised or vitriolated bones tends in course of time to become less, and the percentage of insoluble phosphate greater by the process of reversion, limits of error have been prescribed which will meet this natural variation in the character of the article. The expression "percentage of albuminoids" in the second schedule is to be taken as the percentage of nitrogen multiplied by 6.25.

The Board would be glad if you would at once take steps to bring this circular and the enclosed documents before your Local Authority, and they would be happy to forward additional copies to you for distribution among the members of your Local Authority and the officers concerned, upon being informed of the number you require. It is very desirable that a copy of each of the enclosed documents should without delay be placed in the hands of the Agricultural Analyst and the Official Sampler or Samplers, if any, appointed by your Local Authority.

I am, Sir, your obedient Servant,

T. H. ELLIOTT, *Secretary*.

As the result of an enquiry* made on behalf of the Board of Agriculture and Fisheries by Mr. R. F. Crawford into the conditions of the chicory industry in this country and in Belgium, it was ascertained that though there was little difference between the English and Belgian methods

**Reduction in the
Duties on Home
Grown Chicory.**

* Report on the Cultivation and Drying of Chicory in Great Britain and Belgium [Cd. 2169]. Price 2d.

of cultivating chicory, there were certain differences in the methods of collecting and assessing the Excise and Customs duties on chicory which operated to the disadvantage of the home industry.

The matter was accordingly laid before the Treasury, and the Board are now informed that the Lords Commissioners of H.M. Treasury, after consultation with the Revenue Boards, have arrived at the conclusion that the practical grievance of the home-growers consists in the fact that their chicory is assessed for excise duty on its weight on delivery from the warehouse, including the weight of moisture which it has accumulated during deposit there, while the foreign chicory is assessed for Customs duty on its weight on deposit in the warehouse. To remedy this grievance their Lordships have authorised the Commissioners of Inland Revenue to base the charge of Excise duty not on the delivery weight, but on the computed weight of the chicory at the time of its deposit in the warehouse.

The Board think that this decision will be received with much satisfaction by those concerned, inasmuch as the British grower of chicory will now be enabled to adopt the process of high-drying, and so escape the duty which he now pays on moisture contained in ordinary kiln-dried chicory. The effect of high-drying would be to decrease the duty from about 60s. to about 49s. per ton of chicory root, and thus to increase the value of an ordinary crop by £5 per acre.

A number of general estimates have been published from time to time of the cost of producing farm products, but it is

**Cost of Producing
Farm Products.**

probably not too much to say that the great majority of farmers have but little knowledge of the actual outlay involved in the different farm operations after allotting to each its proper share of the cost of machinery, labour, interest on capital, etc.; and although a profit may be obtained on the working of the farm as a whole, it is only by a well-thought out system of book-keeping that a farmer can secure that each of his undertakings is contributing its fair share of profit. In order to help farmers to appreciate the importance of this question, the

Minnesota Agricultural Experimental Station, in conjunction with the United States Department of Agriculture, devised an elaborate system of collecting statistics on all subjects connected with the cost of production, for the purpose of showing by figures based on the average results from a number of farms what was the average cost per acre of producing different crops, the net profit from different systems of rotations, and similar data.

Three young men, students at the College, were employed continuously at this work for three years, and kept elaborate records of the whole work and life of about eight farms each. Each group of farms was situated in a different district in the State of Minnesota, and the collector visited the farms assigned to him daily, residing at them each in turn for three days a month. At the beginning and close of each year complete inventories were taken of all live stock, machinery, feeding stuffs, etc., and during the year an account was kept of all receipts and payments, of the amount of labour both by men and horses given to each crop, of the extent to which machinery was used for each crop so as to allot a proper proportion of the cost to each, and of similar details. During the three days spent on each farm, the collectors ascertained by weighing and measuring the amount of feeding stuffs given to the live stock, and the yield of milk and the percentage of butter-fat from each cow in the herd. The feeding records and yields of products thus obtained were reduced to a daily average and combined with results from the other farms. The household consumption was also recorded to show the value of the board given with wages.

The actual results are in themselves of little interest to growers in this country, but it may be pointed out that besides the bare facts as to the cost of growing certain crops, they afford an opportunity for experimental work of great usefulness to farmers, by enabling a comparison to be made of the cash results obtainable from different systems of feeding or from different crops. An example may be taken from the Bulletin in which these results are published,* where the results of feeding cows on the produce of ten acres of clover and timothy

* *Bureau of Statistics. Bulletin No. 48.*

hay are compared with those obtained from the produce of the same area of field-cured maize, the question being which system gives the greatest return per acre. The same proportionate quantity of grain was given in addition throughout. Cows whose milk contained a large proportion of butter-fat were employed, and it was found that the clover and timothy from ten acres, at 2 tons per acre, maintained 10 cows for six months, while the fodder maize, at 3 tons per acre, kept 11 cows for the same time, but owing to the higher cost of producing the maize the net profit from the clover was £17 7s., while that from the maize was only £9 12s. 10d. If, however, a yield of $3\frac{1}{2}$ tons of maize were obtained, 13 cows could be kept and the profit raised to £16 0s. 5d., while at 4 tons per acre feeding 15 cows a return of £22 7s. 10d. is shown. This return would, however, be exceeded by the results from a yield of $2\frac{1}{2}$ tons of clover and timothy.

The cost of producing the crop of clover and timothy is put at £14 10s. 5d. and that of the maize at £25 8s. 5d., and as the cost does not appreciably vary with the size of the crop it is not until a yield of 4 tons of maize is obtained that the larger yield is sufficient to compensate for the increased cost of production.

A very important factor in these calculations is the productive capacity of the cows. The cost of labour and of rough fodder is approximately the same for a poor cow as for a good cow, charges for interest and for concentrated foods may be less, but it is impossible for any feeder to reduce the total expense for a poor cow in proportion to the decrease in her produce as compared with the produce of a good animal. This is brought out in the table on the next page where the results are compared.

It will be seen from this that whilst the proportionately more expensive fodder (maize) enabled a greater profit to be obtained when given to high-class cows, its use resulted in a small loss when given to poor cows.

This table shows the influence of the cost of producing forage upon the net profits from cattle-feeding, and taken in conjunction with similar statistics in the Bulletin mentioned above suggests that whenever any factors, such as low prices, low productivity of cattle or long distance from markets with low

local prices, cause a relatively small gross product from the cattle, the greatest net profit will be obtained by the use of cheap fodder crops. On the other hand, when high prices for products prevail, when cattle are highly productive and where good markets are close at hand, the gross product from cattle may be increased by feeding the maximum number of cattle on

—	Cows of high productivity.		Cows of low productivity.	
	Ten cows fed on the produce of 10 acres of clover and timothy at 2 tons per acre.	Fifteen cows fed on the produce of 10 acres of maize at 4 tons per acre.	Ten cows fed on the produce of 10 acres of clover and timothy at 2 tons per acre.	Fifteen cows fed on the produce of 10 acres of maize at 4 tons per acre.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Interest charges on capital value of cows at 5 per cent. ...	2 1 8	3 2 6	1 9 2	2 3 9
Cost of labour for 6 months ...	21 17 6	32 16 3	20 9 7	30 14 4
Cost of grain given to cows ...	14 15 10	22 3 9	5 2 11	7 14 4
Cost of producing hay or fodder ...	14 10 5	25 8 5	14 10 5	25 8 5
Total cost ...	53 5 5	83 10 11	41 12 1	66 0 10
Cash received from produce of cows ...	70 12 6	105 18 9	43 5 5	64 18 1
Difference = profit or loss ...	+ 17 7 1	+ 22 7 10	+ 1 13 4	- 1 2 9 (loss)

a given acreage with relatively expensive fodder crops. In short, the increase in the product must be proportionately greater than the increased cost of production.

One result which has been obtained from these investigations has been the introduction of improved methods of farm book-keeping, and in this connection the report observes that the fact that many farmers have made money without the aid of systematic plans for field management and farm accounts does not mean that they could not have made more money had their business been more systematically conducted with the aid of well-kept accounts, and the failures of many farmers to make a

financial success of agriculture are due in many instances to the lack of system and intimate knowledge of the business, which can only be acquired by means of systematic farm plans and profit and loss figures. Mistakes once made which are clearly shown in the books, may be rectified in succeeding years, whereas poor methods may remain in vogue for a long period if no means are at hand for knowing the exact position of the enterprise. Many farm operations are carried on at a loss, which must be met by the profits from other branches if the farm as a whole is to be remunerative to the farmer. The remedy is a system of book-keeping which will clearly show each year the financial status of each enterprise.

Asparagus is cultivated in France, not only in gardens, but also in open fields in many of those districts where the soil is favourable to its production. Not much risk is involved in its growth, as it suffers much less from disease than many other crops; no expensive machines are required, and the capital outlay is not great. At the same time, the market is a large one, as the consumption of this vegetable has become very popular in France, and it is sold at prices within the reach of all. Its production is chiefly in the hands of the small holders.

**Artificial
Manures for
Asparagus.**

In view, however, of the lack of exact information relating to the best method of manuring and cultivation, an exhaustive investigation* has been made by Messrs. Rousseaux and Brioux at the Experiment Station for the Department of Yonne, the results of which, although primarily of local application, may be of interest to growers in England.

The soils on which asparagus is grown in this district are very light, sandy, poor in clay and humus, and consequently very subject to a great loss of manurial constituents by rain, and whilst relying on farmyard manure as a basis which furnishes to a soil of this character the humus it naturally lacks, it has been

* *Bulletin Mensuel, Ministère de l'Agriculture*, November, 1906. See also "Asparagus Growing in France," *Journal*, November, 1906, p. 493.

found that the addition of artificial manures produces a marked increase in the yield, especially where the soil or subsoil contains a sufficient proportion of clay to give it a moderately retentive character. A fertiliser which proved very suitable for light sandy soils with a permeable sub-soil was composed of 2 to $2\frac{1}{2}$ cwt. of basic slag, $1\frac{1}{2}$ cwt. of nitrate of soda, and $\frac{3}{4}$ cwt. of sulphate of potash per acre. The basic slag was put on in the course of the winter at the same time as the farmyard manure. The sulphate of potash and part of the nitrate was applied early in March and lightly covered in. In rainy weather, however, the application is delayed. It is recommended that the nitrate of soda be applied in several doses in order to obtain the best results on these light soils.

For less sandy soil or light loam with a somewhat clayey sub-soil, larger quantities of manure are recommended, viz. : $1\frac{1}{2}$ to 2 cwt. of mineral superphosphate, $1\frac{1}{2}$ to $2\frac{1}{2}$ cwt. of nitrate of soda (in three applications) and $\frac{3}{4}$ to $1\frac{1}{4}$ cwt. of sulphate of potash. The full effect will not be obtained the first year, but in subsequent years the crowns of asparagus will be much more vigorous and the unused manurial constituents will serve to enrich the stores of plant food in the soil.

Whilst the employment of farm-yard manure is always to be recommended, artificial fertilisers may occasionally be employed alone, if necessary, where the soil is well provided with humus and is fairly retentive. For this purpose $2\frac{1}{2}$ cwt. of mineral superphosphate or $3\frac{1}{4}$ cwt. of basic slag, 2 cwt. of dried blood, 2 cwt. of nitrate of soda and $1\frac{1}{2}$ cwt. of sulphate of potash may be used.

The effect of these manures over several successive years has been to increase not only the quantity of asparagus gathered, but also the average weight and earliness.

Messrs. Rousseaux and Brioux consider there is no ground for the belief entertained by some growers that the use of chemical manures will shorten the productive period of the asparagus beds.

In clay soils sufficiently provided with potash, sulphate of lime may be used instead.

**Registration
of Stallions
in Wisconsin.**

With a view to the improvement of horse-breeding in Wisconsin, the Legislature of that State has recently adopted a system for the registration of stallions, by which every person keeping a stallion for profit is required to obtain a licence-certificate from the Department of Agriculture. In order to obtain this certificate the owner, besides furnishing the pedigree, &c., of the animal, has to declare on oath that the stallion is, to the best of his knowledge, free from hereditary, contagious or transmissible unsoundness or disease, or else to furnish a certificate of soundness signed by a qualified veterinary surgeon. The law only came into force in January, 1906, so that sufficient time has not yet elapsed for the benefits of the system to be apparent, but it is said* to have had a valuable effect in directing the attention of farmers to the importance of using sound sires. New departures and improvements in old-established industries come by education rather than by the enforcement of stringent legal measures, and the law was regarded to a large extent as educational. Owners were given the privilege of either making an affidavit of the soundness of their horses or obtaining a veterinary certificate, as it was thought that this plan would at least draw attention to the importance of soundness in breeding animals, eliminate some of the unsound sires, emphasize the need of sound brood mares, and, in time, lead to more stringent and effectual methods of examination. The law has already had beneficial results by retiring from service upwards of one hundred unsound stallions, and by provoking discussion on the subject. The average farmer, however, shows little disposition to patronize the pure-bred stallion in place of the common non-pedigree animal, so long as a higher service fee is charged for the pure-bred than for the other horse.

A number of suggestions are made with a view to improving the present law: for instance, as no provision is made for the renewal of the licence-certificates, it is proposed that they should be required to be re-issued annually or biennially. The adoption of a list of diseases to be considered "hereditary, transmissible, or communicable" is recommended, and the provision of a system of State veterinary inspection.

* University of Wisconsin, Agricultural Experiment Station. Bulletin 141.

A writer in the *Rhodesian Agricultural Journal* (October, 1906) states that there is a demand among farmers in Rhodesia for a better class of animal than can now be

**Demand for
Cattle in
Rhodesia.—
Import
Regulations.**

obtained in the territory. Owing to past restrictions on importation, the want of bulls of a good type has resulted in a depreciation in the quality of the young stock, and the purchase of pedigree animals at about £30 each from established herds in Great Britain is suggested. The Shorthorn, Aberdeen-Angus, and Friesland breeds are recommended for crossing with the native or existing stock, while other breeds such as the Devon, Hereford, and Ayrshire, may find their place in Rhodesia and be suited for some purposes and certain localities. It may be noted that according to information received by the British South Africa Company, dated 27th January, 1907, the prospects throughout the country are excellent. The acreage under cultivation shows a large increase, and the development generally is stated to be remarkable.

The regulations, dated 26th July, 1906, for the importation of cattle from Great Britain or Ireland, provide—

That every animal so imported is to be accompanied by a satisfactory certificate signed by a qualified veterinary surgeon showing that the animal has been submitted to, and resisted, the tuberculin test, either before being embarked or upon arrival in port. If this certificate is not produced the animal is to be quarantined and tested under the direction of the chief inspector of cattle, and if tuberculosis is disclosed the animal is to be slaughtered. All expenses are to be borne by the owner.

Iceland.—The Board of Agriculture and Fisheries are informed through the Foreign Office that according to Law No, 56, dated November 10th, 1905, the importation into Iceland of horses, cattle, sheep, goats, and swine is prohibited. The Ministry for Iceland may, however, with

**Live Stock
Import Regu-
lations.***

* Live stock import regulations have been published in this *Journal* for the following countries :—United States, June, 1903, and Sept., 1906; Argentina, Jan., 1905, April, 1905, Oct., 1905, and June, 1906; Canada, March, 1905; New South Wales,

the advice of the veterinary surgeon, grant exemption from this prohibition provided that stringent regulations be observed. The Law of 17th March, 1882, prohibiting the importation of foreign cattle, is repealed.

Italy.—The Board have been informed through the Foreign Office that the importation of live stock into Italy from Great Britain and Ireland is subject to a sanitary inspection by a Government veterinary surgeon at the place or port of arrival. In addition, the animals to be imported must be accompanied by sanitary certificates issued by the local authority of the place of origin and viséd by the Italian Consul or Consular Agent having jurisdiction in the place from which the animals are originally despatched.

India.—The Board are informed by the India Office that there are no restrictions on the importation of live stock from Great Britain, but the number and value of the stock should be stated. Horses, however, if found to be diseased would come under the Glanders and Farcy (India) Act of 1899.

The Board have received from Sir Henry Howard, through the Foreign Office, the following synopsis of a Bill which was presented to the States General of the Netherlands in November last with a view to amending and amplifying the law of the 9th of July, 1900,* for preventing fraud in the butter trade :—

**A New Butter
Bill in Holland.**

Commercial butter must contain a certain percentage of fat, to be fixed by Royal Decree. Margarine shall not indicate a higher Reichert-Meissl number than 10 for the volatile fatty acids contained in it. The manufacturers of margarine, and of margarine and butter together, are to be registered. Manufacturers of margarine shall not deliver or forward butter, or store butter for the purpose of being forwarded. No margarine or other fat which can be mixed with butter is to be allowed

April, 1905 ; Germany, May, 1905 ; New Zealand, June, 1905 ; South Australia, July, 1905 ; France, August, 1905 ; Belgium, Sept., 1905 ; Uruguay, Oct., 1905 ; Victoria, Nov., 1905 ; Spain, Dec., 1905 ; Queensland, Jan., 1906 ; Western Australia, Feb., 1906 ; Tasmania, March, 1906 ; Transvaal, June, 1906 ; Ceylon, Cape Colony, Sept., 1906 ; Holland, Malta, Oct., 1906 ; Natal, Austria-Hungary, Nov., 1906 ; and Russia, Hungary, Dec., 1906.

* *Journal of the Board of Agriculture*, September, 1900, p. 237.

on premises where butter is made, or in places communicating therewith. Persons who manufacture margarine as well as butter are to be subject to special and continuous Government supervision as regards the places where butter is made and stored, and must themselves bear the expense of this supervision. Premises where butter is made and stored are to be separated from those where margarine is made and stored. Traders and shopkeepers who make mixtures of butter with any other fat are considered to be manufacturers of margarine.

Officials whose special duty it is to see that this law is duly observed are authorised at all times to enter premises where butter, margarine, and foreign fats are manufactured, and also the places used for storage by the manufacturers concerned. They may also take samples in all such places. Similar authority is given as regards shops, auction-rooms, premises used for storage, and other places where butter, margarine, or other fats are present or are supposed to be present, and also as regards delivery vans or other means of conveyance. As regards places where the above-mentioned fats are manufactured, authority is similarly given to chemists who make analyses for judicial purposes.

The Bill contains a stipulation giving power to prepare regulations as regards the importation of foreign butter. Wilful contravention of the principal provisions of this law are punishable with imprisonment only.

One of the most popular and commonly used methods of preserving eggs is by means of water-glass. Though this method

**Preservation
of Eggs in
Water-Glass.***

was introduced only comparatively recently, it has largely superseded older methods, and appears to have led to the more frequent preservation of eggs on a small scale in households and by small traders. Usually eggs are obtained when they are plentiful and cheap in spring and preserved for use during the winter months, so that it is necessary to keep them for about six months. Some experiments as to the length of time they would keep without undergoing decay or any other serious change in composition was made by Mr. James Hendrick,

* See Leaflet No. 83. "Preservation of Eggs."

B.Sc., of the University of Aberdeen,* in which it was found that eggs which had been kept in water-glass for a few months could hardly be distinguished in appearance, flavour, and smell, either raw or cooked, from what are called "fresh eggs," that is, fresh eggs in the commercial sense, which may be several days old. The eggs which had been preserved in water-glass for about six months tasted and smelt like well-kept eggs a few days old. As the eggs in question were a few days old when they went into the water-glass, it did not seem that they were appreciably changed.

As the eggs get older, however, a distinct change occurs which can be appreciated both by the eye and palate. Eggs which have been three or four years in water-glass are easily recognized. The white becomes pink in colour and very liquid, and the eggs acquire a slightly peculiar taste suggestive of soda. At the same time, even when four years old, the eggs had no unpleasant taste or smell, and the white coagulated in the usual manner in cooking. The changes in the preserved eggs take place very gradually. At one year old they are hardly noticeable, at two years they are distinct, but not so distinct as at three or four years old.

An endeavour was also made to determine whether any distinct changes take place in the composition of eggs when kept in water-glass, and especially whether the soda and silica of the water-glass penetrate into the egg to any great extent. The general conclusion arrived at is that there is practically no change in the composition even from lengthened immersion, and that practically no silica, and very little, if any, soda, find their way into the eggs. A slow deposition of silica takes place in the shells, which blocks up the pores of the shells to some extent, and renders them less permeable.

The annual publication by the Board of Agriculture and Fisheries on the Distribution of Grants† for Agricultural Education and Research, for the year 1905-1906, is prefaced by a Report by Dr. Somerville, and contains reports on each of the institutions receiving grants, an account of the

**Report
on Agricultural
Education.**

* *Journal of Agricultural Science*, January, 1907.

† Cd. 3317. Price 10d.

agricultural instruction provided by County Councils, and of the methods adopted for giving instruction in manual processes. The total sum awarded during the year for educational purposes was £10,550, and in addition £355 was devoted to Grants for Experiment and Research.

During the year, the Board were able to add two educational institutions to those that they previously supported with financial aid, having awarded a grant of £100 to the Hampshire Farm School at Basing, and a similar sum in respect of the Agricultural Institute in the County of Bedford. The former of these institutions approaches in character the so-called "Winter-schools" of Germany,* which open in autumn after the main work in the fields is over for the year, and close in spring in time to allow of the pupils returning to their homes in readiness to take part in the important operations of early spring. In summer the school premises are utilized in imparting instruction in dairying to female students. A school with precisely similar functions has for some years existed in Cumberland, and has been found to be of the greatest possible assistance to the County Councils of Cumberland and Westmorland in the development of their schemes of rural education. It is a type of institution that might with much advantage be duplicated once or oftener in every county in England, and the Board are glad to be able to give their support to examples in the north and in the south, which may serve as models to other Education Authorities. The Agricultural Institute in Bedfordshire is at present in something of a transition stage, acting as a Winter School in Agriculture and a Summer School in dairying. It is hoped that it may develop into a centre from which the local requirements of a group of counties in East Anglia may be served.

In pursuance of their policy of encouraging the acquisition of farms by Agricultural Colleges, the Board awarded a grant of £200 to the University College of Aberystwyth for this purpose. There are now eight institutions which receive separate grants for farms.

As regards the work of education at the various institutions aided by the Board, the Report states that there is the

* See page 691.

same steady progress that has characterized it during past years, and on all sides there is abundant evidence of the broadening of the educational basis, of the widening of public interest in the subject, and of an increase in the number of pupils. During the past year, it is estimated, some 1500 pupils pursued courses within the walls of the various institutions, while about 32,500 attended local courses provided by, or in association with, the central institution. It is gratifying to find that farmers are utilizing more and more the organisation of the collegiate centres for the supply of information on the practical details of their business. The number of direct inquiries by practical farmers that are addressed to the members of the staffs with regard to such subjects as manures, foods, seed-mixtures, insects, and diseases is annually increasing; while the scheme instituted by the Board, under which dairy farmers may be kept informed of the periodic and individual fluctuations in the quality of milk, is attracting more and more attention.

In previous Reports the Board have endeavoured to supply specific information in regard to special aspects of rural education, and in the present volume the subject dealt with is the "Processes of Agriculture." The Board have found that in consequence of information in regard to the organisation of school gardens being made readily available as in their last Annual Report, many local authorities have given their attention to the subject, with the result that this valuable educational agency is being much more fully utilized than formerly. It is to be hoped that a similar result will follow the distribution of information on the Processes of Agriculture, a subject which is intimately associated with the efficiency of rural labour; and with the success of agricultural operations.

A method of agricultural instruction which has proved very successful in Germany is the system of winter schools. These are intended for the lower ranks of the agricultural population, and the various courses are carefully framed with a view to consolidating and extending the education acquired at school, and to instructing the pupils in the princi-

**Agricultural
Winter Schools
in Germany.**

ples on which the various agricultural operations are based. The instruction given presupposes a knowledge of the subjects taught in the elementary and continuation schools, and this has proved one of the great difficulties, as, in practice, the winter school has to provide for young people of very varying degrees of knowledge. If the pupils are assumed to have received an elementary education only, and the instruction is made suitable chiefly for the sons of peasant-farmers, small holders, and cottagers, the sons of medium farmers, &c., are left out, and no opportunity is afforded them, within reach of home, of widening their practical knowledge.

In practice it is found that the pupils come both from the secondary and from the village schools, while their ages vary from fifteen to thirty, so that it is left for the teachers to adapt their instruction to the needs of the pupils according to their own judgment. The needs of the middle and lower ranks of the agricultural population for technical instruction seem to be largely met by these institutions, which have greatly developed in the last twenty years.

As their name implies, they are open only in the winter, the pupils spending the summer months at home when they are wanted to help in work on the farm, and it is thought that this arrangement has had a great influence in developing these schools. They thus acquire practical knowledge, and the instruction given is theoretical only. The courses last, from the beginning of November to the end of March, for two winters.

In the first winter's session instruction is given for fifty-four hours weekly, of which nineteen are devoted to technical subjects, eighteen to science, and seventeen to general subjects; in the second session the technical subjects get twenty-five hours, the allied sciences fifteen, and elementary subjects nine, though the proportions may vary in different schools.

The object of the winter school is then to provide an education for the sons of small farmers and the rural population generally: (1) it extends the knowledge obtained at school, (2) it provides the basis of a knowledge of natural science, so far as concerns agriculture, and (3) it teaches the principles of agriculture so that the processes and operations of the farm may be understood

both economically and scientifically. Some of the schools are more advanced than others, but the majority presuppose only a good elementary school education, with one or two years' practical work on a farm. Most of the institutions have small experimental fields, orchards, and gardens for demonstration purposes.

Only occasionally do the schools take resident pupils, the scholars usually living in lodgings in the town or village. The total cost for board and lodging varies from £9 to £20, while the fees for tuition average 30s. for the first session, and less for the second. The schools are supported by grants from the State, Provincial, and local bodies and Chambers of Agriculture. The Principals of the schools are generally employed as migratory teachers in summer, while the other teachers who attend to give lectures usually have some other employment. There were, in 1904, 968 teachers in 131 schools in Prussia with 5,366 scholars, or 7 teachers and 41 scholars per school. In Bavaria 37 institutions had 408 teachers and 1,385 scholars. In the whole of Germany there are probably 230 winter schools.

A very similar form of agricultural instruction is found in the farm schools (*Ackerbauschulen*), which do not differ very materially from the winter schools except in the fact that they are open for the whole year. Originally this class of school was almost entirely practical, and the pupils received wages for their labour. Gradually, however, the practical instruction has been abandoned in favour of the theoretical, and, at the present time, most of these schools are of the latter kind, practical teaching only being given in fruit cultivation and similar branches. The fees for resident students are £30 to £40 per annum. The number of these institutions is decreasing the winter schools, which are intended for the same class of pupils, having, practically, taken their place by supplying similar instruction at a lower cost and leaving the summer free for work on the farm. There are 19 of these schools in Prussia with 149 teachers and 1,224 pupils, and 5 schools in Bavaria with 63 teachers and 239 pupils.

The Select Committee of the House of Commons to whom the Housing of the Working Classes Acts Amendment Bill was referred have issued a Special Report (*H.C.* 376, price 4s. 9d.) reviewing the existing law relating to the housing of the working classes in rural districts, and making a number of recommendations for future legislation.

**Report on
Rural Housing.**

The Committee had abundant evidence put before them as to the insufficiency of cottages in rural districts, and though many landowners have spent considerable sums of money on the erection of cottages from which no direct return is obtainable one of the main reasons for the lack of accommodation is the difficulty of building cottages to yield an adequate interest on the outlay to the owner. But there is abundant evidence to show that the difficulty of rent would be largely diminished by the addition of land to the cottage. The labourers and others who gave evidence before the Housing Commission of 1885 on the subject stated that the men could pay higher rent and "would be pleased to do so" if land, arable or pasture, were attached to the dwellings. One witness of considerable experience, while admitting the difficulty of paying rent for good cottages alone, said it was "easy to pay fair rent for land and cottage together." He considered the two to be so necessary that he declined to consider them apart. The above evidence as to the great value to labourers of small plots of land to supplement their wages has been amply confirmed by the evidence received by the Committee.

One of the amendments proposed by the Bill was to enlarge the amount of land that may be attached to a cottage from a maximum of $\frac{1}{4}$ acre and £3 annual value to a maximum of 3 acres and £10 annual value, and the Committee consider that no reform in connection with rural housing can be of any effective use unless further facilities for the acquisition of land are given.

What is primarily wanted is that the young agricultural labourer should have a fair prospect of being able to progress by the exercise of thrift and energy from the position of labourer to that of an independent occupier. The present conditions are of such a character that any such advancement in life is surrounded with the utmost difficulty. Though he may be

endowed with qualities that make for success in other callings in life, the labourer recognises that the land holds out but little hope or reward to him, and sees nothing before him but to live and die a labourer.

Apart from the fact that an ill-repaired cottage is a contributory cause of the migration to the towns by the young and more intelligent element in the rural population, the Committee have had ample evidence to show that migration is also largely due to the monotonous existence and lack of prospect held out to the younger generation under the present system. The contrast between life in the country and in the town is so manifest that it is not to be wondered at that large numbers every year migrate to the latter. It is aggravating the condition of the towns as regards overcrowding and unemployment, and it is paralysing the prosperity of the country districts by depriving them of the necessary population. Large sums of public money are being spent to alleviate the evils of overcrowding and a congested labour market in the towns, whilst the country districts are spending an ever-increasing amount in rates to turn out a more educated population, the best of whom migrate in large numbers to the towns and deprive the country ratepayer of the results of his local expenditure. This migration can best be checked by giving greater facilities for the renting or purchase of sufficient land to afford a profitable career to those who remain in the country. What can be done is shown by the results obtained in those districts where facilities, though only to a partial extent, have been given for obtaining land for small holdings. Frequent instances are to be found of men gradually improving their condition in life by profitable working of small pieces of land. Such examples are an incentive to others in the district to remain at home and start on the same career.

The Committee consider, therefore, that legislation should be directed to secure land under the most advantageous circumstances (1) for allotments for the labourer in regular employment, (2) for small holdings for the independent labourer in irregular employment, and (3) for holdings for the small farmer.

With regard to allotments, the Committee observe that these are now fairly universal, but in many villages they are often inconveniently situated at a distance from the labourer's home.

If the allotment could be made part of the property of a man's cottage the cottager would be more likely to cultivate it in his spare time. Moreover, a home garden, besides helping to keep the house healthy, would enable the wife and children to help in it in many profitable ways, which cannot be done at a distance. The Committee are strongly of opinion that where an allotment field is shown to be inconvenient to the majority of allotment holders the County Council should have full powers to make the necessary exchange.

The Committee strongly urge that the County Council should be given compulsory powers to acquire land for both the above purposes, *i.e.*, allotments and small holdings. In order to avoid any arbitrary treatment of a landlord by land being expropriated inconveniently near to the demesne or to the serious detriment of tenants occupying existing holdings, provision should be made for appeal to a proper tribunal. The Committee suggest that the Board of Agriculture would be the best body for the purpose, and they recommend a simplification of the law for acquiring land compulsorily and loans by the Treasury at the lowest rate at which the Treasury can themselves borrow.

The transfer of the administration of the Public Health and Housing of the Working Classes Act from the Rural District Councils to the County Councils is also recommended, the Rural District Councils retaining the concurrent power to build under Part III. of the Housing of the Working Classes Act, 1890, and there are also a number of recommendations directed to the amendment of the Act, especially as regards sanitary administration.

In the course of last month the Board received a request from a firm of produce agents, whose name can be obtained on appli-

**Demand for
English Eggs.**

cation, to be put into communication with dealers in English eggs, or egg collectors, who could supply them with consignments of not less than five cases at a time for sale on commission.

ADDITIONS TO THE LIBRARY.

Africa—

Egypt.—Second Report of the Wellcome Research Laboratories at the Gordon Memorial College, Khartoum. (255 pp.) Khartoum: Department of Education, Sudan Government, 1906.

Cape of Good Hope.—Geological Commission. Report for 1905. (296 + VI. pp.) Cape Town: Department of Agriculture, 1906.

Australasia—

New Zealand.—Department of Agriculture. Report for 1905-6. (531 pp.) Wellington, 1906.

Belgium—

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Canada—

Minister of Agriculture for the Dominion of Canada. Report for the five months ended March 31st, 1906. (xlvii. + 9 pp.) Ottawa, 1905.

Denmark—

Rostrub, E.—Tidsskrift for Landbrugets Planteavl, 12^e Bind. (472 pp.) 13^e Bind, 1^e Hefte. (198 pp.) Copenhagen: Gyldendalske Boghandel Nordisk Forlag, 1905.

France—

Moreau, Dr. A.—L'Abattoir Moderne, Construction, Installation, Administration (477 pp.) Paris: Asselin et Houzeau, 1906.

Varenne, E.—L'Alcool dénaturé. (166 pp.) Paris: Masson et C^{ie}, n.d.

Beilenoux, E. S.—Dictionnaire des Engrais et des Produits Chimiques Agricoles. (158 pp.) Paris: Schleicher Frères et C^{ie}, 1904.

Kohler, B.—L'Amélioration rationnelle du Bétail par les Syndicats d'Élevage. (146 pp.) Paris: Librairie Agricole de la Maison Rustique, 1906, 2 fr. 50.

Germany—

Holrung, Dr. M.—Jahresbericht über das Gebiet der Pflanzenkrankheiten, 1905. (340 pp.) Berlin: Paul Parey, 1907. 15 marks.

K. Biologische Anstalt für Land- und Forstwirtschaft.—Arbeiten, 5 Band. Heft 5:—Magenuntersuchungen heimischer Raubvögel. (215-292 pp.) Berlin: Paul Parey, 1906.

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Parsons, G. H.—Notable Modern Shorthorns. (43 plates.) Alsager, Stoke-on-Trent: Harold Simms, 1907. 15s.

Morgan, F. A.—Fruit Cities, The Land and the Unemployed. (40 pp.) London: Whitehall House, Charing Cross, 1906. 1s.

Elwes, H. J., and Henry, A.—The Trees of Great Britain and Ireland. Vol. I. 60 plates + 200 pp. Edinburgh (privately printed). To be obtained from Mr. J. Edwards, Colesborne, Cheltenham. [It is expected that this work will be completed in four more volumes, and arrangements have been made for their addition to the Library as published.]

International Co-operative Alliance.—International Co-operative Bibliography. (276 pp.) London: P. S. King & Son, 1906.

Royal Horticultural Society.—*Journal*, December, 1906. (360 + ccxxvi. pp.) London: Spottiswoode & Co., Ltd. Price (to Non-Members) 15s.

Lenox-Conyngham, H. M.—Burden Camels, their Management and Diseases. (24 pp.) London: Baillière, Tindall & Cox, 1904.

Royal Scottish Arboricultural Society.—Transactions. Vol. XX., Part I. 136 + 36 pp.) Edinburgh: Douglas & Foulis, 1906. Price (to Non-Members) 3s.

Waghorn, T.—Agriculture and Railway Rates. (46 pp.) London: Knapp, Drewett & Sons, 1906. 1s.

Shorthorn Society of Great Britain and Ireland.—Coates's Herd Book. Vol. 52 (New Series). Bulls, from No. 90,586 to 93,957, with 6,054 Cows and their produce, to December 31st, 1905. (1,326 pp.) London: The Secretary of the Society, 1906. Price (to Non-Members) 31s. 6d.

Great Britain—Continued.

- Cambridge University*.—Department of Agriculture. Guide to Experiments. (113 pp.) Cambridge, 1906.
University of Leeds.—Bull. 63:—Experiments with Potatoes, 1906, Report. (24 pp.) Leeds, 1907.
Edinburgh and East of Scotland College of Agriculture.—Bull. XI. The Variation in the Composition of Milk. (52 pp.) Edinburgh, 1906.
Agricultural Organisation Socie'y.—Report for the eighteen months ended June 30th, 1906. (127 pp.) London, 1907.
Mason, F. W.—Growth and Cultivation of Sugar Beet. Results of Experiments in 1906. [Report to the East Suffolk Chamber of Agriculture.] Ipswich: Hon. Sec. of the Chamber, Mr. J. A. Smith, Gippeswyk Hall, 1907. 6d.
Royal Commission on Tuberculosis (Human and Bovine).—Second Interim Report. Part I., Report [Cd. 3,322]. (98 pp.) London: Wymans, 1907. 9½d.
Kebbel, T.—The Agricultural Labourer. 4th Edition. (176 pp.) London: Swan Sonnenschein, 1907. 2s. 6d.

Holland—

- Departement van Landbouw*.—Verslag:—
 No. 6. Onze Nederlandsche Kaas.—De teelt en de handel in Nederlandsche zaai- en pootuijen—Veeteelt en Zuivelbereiding in Zweden. (109 pp.) The Hague: J. and H. van Langenhuysen, 1906, f. o. 50.
 No. 7. Paardenfokkerij. (84 pp.) The Hague: J. and H. van Langenhuysen, 1906, f. o. 30.

India—

- Department of Agriculture in India, Pusa*.—Forest Bulletin:—
 No. 7.—Notes on the Chilgoza Forests of Zhob and the Takht-i Suliman (35 pp.) Calcutta: Superintendent of Government Printing, 1906.
 No. 9.—Notes on the Influence of Forests on the Storage and Regulation of the Water Supply. (58 pp.) Calcutta: Superintendent of Government Printing, 1906.
 Bulletin No. 3 of 1906:—The Extension of Jute Cultivation in India. (46 pp.) Calcutta: Superintendent of Government Printing, 1906.

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d'Emilia, G.—Elucubrazione sul Parassita delle Piante e sull'afra Epizootica. (18 pp.) Rome: A. Befani, 1907.

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- Bureau of Animal Industry*.—Bull. 91. Feeding Prickly Pear to Stock in Texas. (23 pp.) Washington, 1906.
Bureau of Chemistry:—
 Bull. 102. Foreign Trade Practices in the Manufacture and Exportation of Alcoholic Beverages and Canned Goods. (45 pp.) Washington, 1906.
 Bull. 103. Experimental Work in the Production of Table Sirup at Waycross, Ga., 1905. (38 pp.) Washington, 1906.
Bureau of Entomology:—
 Circ. 80. The Melon Aphis. (16 pp.) 1906.
 Technical Series, Bull. 13. A Revision of the Tyroglyphidæ of the United States. (34 pp.) Washington, 1906.
 Technical Series, Bull. 14. The Bacteria of the Apiary, with special reference to Bee Diseases. (50 pp.) Washington, 1906.
Forest Service.—Circ. 51. Wood used in Veneer in 1905. (4 pp.) Washington, 1906.
Indiana.—Horticultural Society. Transactions for 1905. (256 pp.)
Kansas.—Agricultural Experiment Station:—Bull. 140. Milking Machines. (67 pp.) Manhattan, 1906.

West Indies—

- Imperial Department of Agriculture*.—Lectures to Sugar Planters. (176 pp.) London: Dulau & Co., 1906. 1s.

[Books may be borrowed from the Board's Library on certain conditions, which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of January, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 11	7 5	37 4	33 10
Herefords	7 9	7 3	—	—
Shorthorns	7 9	7 2	36 6	33 4
Devons	8 2	7 7	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	8½	7
Sheep :—				
Downs	9½	8½	—	—
Longwools	9	8	—	—
Cheviots	9½	8½	9½	8½
Blackfaced	9	8½	9	8
Cross-breds	9½	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	6 8	6 4	6 7	5 10
Porkers	7 6	7 0	7 3	6 4
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	21 8	18 3	22 9	18 7
„ —Calvers	21 12	17 7	19 18	16 11
Other breeds—In Milk ...	21 2	16 2	18 6	15 7
„ —Calvers	13 15	13 0	18 1	15 5
Calves for Rearing	2 1	1 12	2 3	1 16
Store Cattle :—				
Shorthorns—Yearlings ...	9 5	7 17	9 6	7 15
„ Two-year-olds	12 18	11 9	14 0	11 16
„ Three-year-olds	15 7	13 16	15 2	14 0
Polled Scots—Two-year-olds	—	—	15 18	14 0
Herefords— „	14 5	12 10	—	—
Devons— „	12 12	11 2	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	47 5	40 7	—	—
Scotch Cross-breds	—	—	35 11	31 3
Store Pigs :—				
Under 4 months	28 0	20 8	20 5	16 2

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of January, 1907.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.	per cwt. s. d.
BEEF :—							
English	1st	52 6	51 6	50 6	—	56 0*	53 6*
	2nd	51 0	46 6	45 6	44 6	53 6*	48 6*
Cow and Bull ...	1st	37 6	44 6	43 0	40 0	44 6	43 0
	2nd	31 0	38 6	38 6	35 6	36 6	37 6
U.S.A. and Cana- dian :—							
Birkenhead killed	1st	52 0	49 0	49 0	49 6	—	46 6
	2nd	47 0	44 0	44 6	45 0	—	42 0
Argentine Frozen—							
Hind Quarters ...	1st	33 6	34 0	33 6	32 6	35 0	35 0
Fore „ ...	1st	28 0	29 0	28 6	27 6	30 6	30 6
Argentine Chilled—							
Hind Quarters ...	1st	38 6	38 6	37 0	36 6	—	40 0
Fore „ ...	1st	32 6	31 6	31 0	30 6	—	33 0
American Chilled—							
Hind Quarters ...	1st	53 0	53 6	53 0	53 0	55 0	54 6
Fore „ ...	1st	37 6	36 6	35 0	35 0	37 6	38 0
VEAL :—							
British	1st	74 6	58 6	73 6	76 6	—	—
	2nd	65 6	57 0	66 6	69 0	—	—
Foreign	1st	74 6	—	—	—	—	64 0
MUTTON :—							
Scotch	1st	74 6	70 0	77 0	77 0	74 6	66 6
	2nd	66 0	—	72 0	70 6	63 6	57 0
English	1st	68 0	71 0	73 6	70 6	—	—
	2nd	62 6	55 0	66 6	65 6	—	—
U.S.A. and Cana- dian—							
Birkenhead killed	1st	—	70 0	70 0	66 0	—	—
Argentine Frozen ...	1st	36 6	37 6	37 6	37 6	37 0	37 6
Australian „ ...	1st	35 0	35 6	35 6	36 0	37 0	—
New Zealand „ ...	1st	48 0	—	47 0	46 6	—	—
LAMB :—							
British	1st	91 0	—	—	—	—	—
	2nd	81 6	—	—	—	—	—
New Zealand	1st	60 6	—	—	—	—	—
Australian	1st	47 6	49 6	45 6	44 6	52 6	49 0
Argentine	1st	47 6	46 6	46 0	45 6	—	44 6
PORK :—							
British	1st	62 0	68 6	67 6	66 0	58 6	59 6
	2nd	54 6	57 6	62 0	60 6	55 6	48 6
Foreign	1st	59 6	61 0	61 0	61 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906, and 1907.

Weeks ended (<i>in</i> 1907).	Wheat.						Barley.						Oats.					
	1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907.	
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan. 5 ...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
" 12 ...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
" 19 ...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
" 26 ...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb. 2 ...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
" 9 ...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
" 16 ...	30	5	28	11			25	2	25	6			16	9	19	0		
" 23 ...	30	10	28	10			25	0	25	4			16	10	19	0		
Mar. 2 ...	30	8	28	8			25	2	25	0			16	10	19	0		
" 9 ...	30	9	28	5			25	2	25	1			16	10	18	8		
" 16 ...	30	10	28	5			24	11	24	8			16	10	18	10		
" 23 ...	30	9	28	4			25	2	24	4			17	0	18	8		
" 30 ...	30	9	28	3			25	1	24	5			16	11	18	11		
Apl. 6 ...	30	9	28	7			25	6	24	2			17	0	18	11		
" 13 ...	30	8	28	11			24	3	24	4			17	6	19	4		
" 20 ...	30	8	29	4			24	4	24	0			17	5	19	1		
" 27 ...	30	9	29	6			24	4	24	0			17	9	19	6		
May 4 ...	30	8	29	10			25	3	23	10			18	0	19	9		
" 11 ...	30	8	30	1			24	10	24	1			18	3	20	0		
" 18 ...	30	10	30	3			24	8	23	10			18	5	20	1		
" 25 ...	30	11	30	4			24	4	24	2			18	8	20	2		
June 1 ...	31	3	30	4			23	6	22	10			19	1	20	5		
" 8 ...	31	4	30	3			24	0	23	4			18	11	19	11		
" 15 ...	31	7	30	4			26	0	23	6			19	1	20	2		
" 22 ...	31	7	30	5			23	9	22	10			18	10	20	2		
" 29 ...	31	8	30	3			23	2	24	3			19	7	20	1		
July 6 ...	32	1	30	2			22	11	23	0			19	6	20	2		
" 13 ...	32	3	30	5			23	10	23	8			19	7	20	4		
" 20 ...	32	2	30	3			23	7	23	2			18	11	20	5		
" 27 ...	32	3	30	5			23	11	22	4			19	3	20	2		
Aug. 3 ...	31	11	30	9			22	0	22	1			18	4	19	3		
" 10 ...	30	5	30	5			22	5	23	0			16	11	17	11		
" 17 ...	28	5	29	0			23	4	24	2			16	4	17	0		
" 24 ...	27	1	27	9			23	6	25	0			15	9	16	10		
" 31 ...	26	11	25	9			23	5	24	3			15	9	16	6		
Sept. 7 ...	27	1	26	4			23	4	24	9			15	11	16	3		
" 14 ...	26	11	25	11			23	7	24	3			16	0	16	1		
" 21 ...	26	8	25	9			23	10	24	3			15	11	16	0		
" 28 ...	26	9	25	9			24	3	24	8			16	1	16	2		
Oct. 5 ...	26	9	26	1			24	9	25	0			16	3	16	3		
" 12 ...	26	11	26	3			24	10	25	3			16	6	16	7		
" 19 ...	27	1	26	6			25	0	24	10			16	7	16	8		
" 26 ...	27	4	26	7			24	11	24	10			16	8	16	10		
Nov. 2 ...	27	10	26	7			24	9	24	8			17	1	16	11		
" 9 ...	28	3	26	6			24	10	24	8			17	4	17	1		
" 16 ...	28	7	26	4			24	6	24	4			17	8	17	2		
" 23 ...	28	5	26	3			24	6	24	1			17	9	17	3		
" 30 ...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec. 7 ...	28	6	26	1			24	7	24	1			17	11	17	4		
" 14 ...	28	5	26	1			24	5	23	11			17	11	17	3		
" 21 ...	28	4	26	3			24	6	24	3			17	11	17	3		
" 28 ...	28	3	26	0			24	7	24	1			18	1	17	3		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: January ...	39 10	39 7	25 0	26 5	21 10	22 11
Paris: January ...	39 7	40 4	25 5	26 7	22 6	23 2
Belgium: November...	1905. 30 9	1906. 28 4	1905. 23 7	1906. 24 9	1905. 20 9	1906. 18 9
December ...	31 1	29 8	23 10	24 1	21 3	20 9
Berlin: November...	39 1	38 11	—	—	21 9	22 9
December ...	39 11	39 7	—	—	22 0	23 3
Breslau: November ...	{ 34 9	37 11	27 5	29 3 (brewing) 23 3 (other)	20 1	21 0
December ...	{ 35 3	37 10	25 1	23 7 (brewing) 23 3 (other)	20 0	21 0

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the quotations for Berlin and Breslau are the average prices published monthly in the *Deutscher Reichsanzeiger*.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of January, 1906 and 1907.

	WHEAT.		BARLEY.		OATS.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	29 9	27 3	24 7	24 2	19 3	18 1
Norwich	28 0	26 0	24 11	24 3	18 2	17 0
Peterborough ...	27 9	25 3	24 4	23 9	18 0	16 7
Lincoln	28 3	25 9	24 6	23 11	17 7	17 1
Doncaster	27 9	25 7	23 7	23 8	17 8	16 9
Salisbury	28 5	25 7	25 4	23 8	19 3	17 10

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of January, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British... ..	16 0	14 0	15 6	14 0	—	—	15 0	—
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery	—	—	111 0	108 6	—	—	—	—
„ Factory	98 0	96 0	100 0	96 0	99 6	92 0	—	—
Danish ...	120 0	118 0	—	—	120 0	115 6	118 6	—
Russian ...	102 6	98 6	104 6	94 0	100 0	94 6	101 0	95 0
Australian ...	103 0	101 0	108 6	101 0	103 0	99 0	105 0	97 0
New Zealand...	108 0	106 6	112 6	110 0	109 0	107 0	108 6	—
CHEESE :—								
British, Cheddar	86 0	80 6	80 0	70 0	80 0	77 6	69 6	64 0
					120 lb.	120 lb.		
„ Cheshire	—	—	—	—	80 6	75 0	—	—
					per cwt.	per cwt.		
Canadian ...	64 6	63 6	64 6	62 6	64 0	63 0	65 6	62 6
BACON :—								
Irish ...	62 0	58 0	—	—	61 0	58 6	63 0	60 6
Canadian ...	56 6	—	57 0	54 0	57 0	52 0	57 0	53 6
HAMS :—								
Cumberland ...	108 0	104 6	—	—	—	—	—	—
Irish ...	109 6	107 0	—	—	—	—	87 6	79 6
American								
(long cut) ...	63 0	62 0	61 6	59 6	61 0	59 0	63 6	60 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	18 11	16 0	17 6	—	—	—	—	—
Irish ...	16 9	14 8	13 5	12 4	13 5	12 6	14 3	13 0
Danish ...	15 6	13 0	—	—	13 6	12 6	15 4	13 8
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Blackland ...	67 0	59 0	69 0	60 0	65 0	60 0	—	—
British Queen...	74 0	65 0	79 0	60 0	70 0	65 0	70 0	65 0
Up-to-Date ...	79 0	69 0	85 0	75 0	73 6	65 0	67 6	61 0
HAY :—								
Clover... ..	103 6	92 0	90 0	80 0	100 0	77 6	84 6	79 6
Meadow ...	99 6	88 6	85 0	75 0	—	—	82 6	77 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JANUARY.	
	1907.	1906.
Swine-Fever:—		
Outbreaks	147	73
Swine Slaughtered as diseased or exposed to infection	607	310
Anthrax:—		
Outbreaks	72	70
Animals attacked	105	95
Glanders (including Farcy):—		
Outbreaks	78	110
Animals attacked	146	186
Sheep-Scab:—		
Outbreaks	145	96

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JANUARY.	
	1907.	1906.
Swine-Fever:—		
Outbreaks	16	1
Swine Slaughtered as diseased or exposed to infection	221	14
Anthrax:—		
Outbreaks	—	—
Animals attacked	—	—
Glanders (including Farcy):—		
Outbreaks	—	1
Animals attacked	—	4
Sheep-Scab:—		
Outbreaks	49	62

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ORCHARD AND BUSH FRUIT PESTS IN 1906.

The majority of the well-known destructive insects of fruit trees and bushes have been reported during the past year from different parts of Britain. Some have appeared in sufficient numbers to cause serious damage in isolated areas only, others have been of more general distribution. Several insects have been reported as doing damage that have not previously been regarded as "pests." These are all well-known native species, except one, which is apparently undescribed, viz., a small "Cecid" fly, the maggots of which have damaged gooseberry bushes in Herefordshire.

Codling Moth.—A considerable number of imported apples have been examined during the past year and very large numbers of the codling maggot (*Carpocapsa pomonella*) were found in certain consignments. Many were found in barrels examined in villages, where on escaping from the barrels or being distributed with the apples, they could easily find shelter for pupating, the moths flying later to adjacent gardens and orchards. This is particularly unfortunate, as this serious pest is one which can easily be kept in check and, in fact, almost stamped out in our orchards, by spraying with arsenate of lead and trapping by means of bands of loose sacking placed around the trunks of the trees in early summer.

The codling moth was not as harmful during the past year as in the summer of 1905. It was complained of in Kent, Worcestershire, and Devonshire. From Herefordshire one grower writes that owing to banding his trees the pest, which

was very serious, has practically disappeared. In Kent similar benefit has been reported by growers. In spite of treatment the codling moth has during recent years increased in some areas. It must be pointed out that this apple enemy is a native of this country, at least its presence goes back so far that we may consider it indigenous, but at the same time the effect of the constant importation must not be overlooked.

This pest occurs all over Britain, but during the past few years it seems to have been of sporadic occurrence. In Worcestershire it does not seem to be much in evidence, except near towns. At Evesham, Stourport, Stoke, and Droitwich it was found in some numbers last year. Near Hereford and Ledbury, in many places in Devonshire, Monmouthshire, Somersetshire, Huntingdonshire, Cambridgeshire, Kent, Surrey, Sussex, and Hampshire it has either been reported or seen during the past summer.

Gold-Tail Moth.—The gold-tail moth (*Porthesia auriflua*) has been somewhat abundant of late years, and from a few places in Kent and Devon it was sent with notes as to its harmful effect on apples, plums, pears, nuts, and hawthorn hedges in 1906.

One interesting new feature has come to light in connection with trapping the codling maggots by "sack-bands." Near Evesham a grower was recommended to follow this plan and it was found that the bands caught at the same time the young gold-tail moths which hibernate as small caterpillars in cocoons in convenient shelters.

Lackey Moth.—The lackey moth (*Clissiocampa neustria*) occurred during 1906 in many districts in the South-East of England. Numerous egg-bands have been received during the winter. Fortunately, growers now recognize that the colonies of these caterpillars do no little damage, and see that the egg-bands are burnt at pruning time. In this way the lackey moth is kept in check, as it does not seem predisposed to invade large trees.

Buff-Tip Moth.—Quite a new attack on fruit trees, mainly cherry, is that of the buff-tip moth (*Pygæra bucephala*). In August last the caterpillars of this handsome moth, well known for its ravages on lime and willows, were sent from various localities in Kent, Hampshire, and Essex. The ravenous nature of the larvæ is such that their presence is sure to be

detected, and owing to their gregarious nature it is easy to cope with them. The damage done to cherry foliage was reported as severe from near Sittingbourne.

Grey Trident Moth.—Although probably not of much account, it is of interest to note that the grey trident moth (*Acronycta tridens*) has attacked fruit trees, both plum and apple, near Liverpool and in Worcestershire, at the former place in sufficient numbers to do considerable harm.

Apple Clear-Wing Borer.—Apple trees in the neighbourhood of Croydon were damaged by the clear-wing borer (*Aegeria myopaeformis*), the larvæ eating into the wood of the small stems and even twigs of several varieties of apples. Judging from the number sent they must have been doing much damage to the trees. Smearing the trees with some noxious compound is all that can be done in such attacks, except removal of the larvæ by means of a knife or wire.

Winter Moth.—The winter moth (*Cheimatobia brumata*) was not as harmful as usual in 1906. Where grease-banding has been followed this pest has been reduced to such an extent that it is now of no great account. No bad attack seems to have taken place generally in Kent, the only instances reported where serious damage was done being in Worcestershire, where four orchards, one of cherry and the others of apples, were badly defoliated. In all these cases there had been no attempt at banding or spraying.

Bud Moth.—The bud moth (*Hedya ocellana*) does not appear to have been as abundant as usual, but it was complained of in one locality in Kent and from another in Worcestershire. Specimens have also been bred from material sent from North Devon.

Pith Moth.—Only one reference has been made to the pith moth (*Blastodacna vinolentella*, H. Sc.) from Kent. This serious pest in young plantations was formerly known as *Laverna atra*, Hawth. Professor Carpenter, who records its presence in Ireland,* shows that previous identifications have been wrong, and that the *Laverna atra* which has been recorded from hawthorn berries is distinct. The difference given is said

* *Economic Proceedings, Royal Dublin Society*, Vol. I, Part 8, p. 333. (1906).

to be in the colour of the head. Both black and creamy-headed forms have been bred from the apple, but there is no doubt that the hawthorn feeder and the apple pith-moth are distinct. So far I have failed to trace this serious enemy of apple growers in England outside Kent and Sussex, with the exception of a single example of its occurrence near Criccieth in North Wales on young stock imported, I believe, from Chester. So harmful is the pith moth in a young plantation that it is well for growers to keep a sharp look-out for it in any newly-purchased stock. I can find no record of it as a pest in Continental Europe or in America; in any case I am sure, from what Dr. L. O. Howard tells me, it is not known in the latter country. Its home in Britain seems to be the south-eastern and southern area of England, but owing to its obscure way of working it may have been overlooked elsewhere. I have, however, failed to trace it in Herefordshire, Worcestershire, Devon, Cambridgeshire, and other fruit counties, and Messrs. Newstead, Warburton, and Collinge do not seem to record it in any of their reports. The example recorded by Carpenter was from near Dublin.

Plum and Cherry Tree Borer.—The plum tree and cherry tree borer (*Sesamia woeberana*) still persists in the Sittingbourne district of Kent, but has been kept down by constant supervision and removal of attacked parts. Two attacks were reported in 1906.

Pear Leaf Miner.—Two interesting Tineid moths have occurred in Worcestershire. One of these, the pear leaf miner (*Cemiosoma scitella*), was reported from that county, and the infested wall tree was found to have every leaf destroyed. This small moth occurs all over Britain, and now and again seems to increase so rapidly that it becomes a serious strain on the attacked tree. Previous damage has been recorded from Scotland and from Cambridgeshire.

Cherry Fruit Moth.—The other Tineid pest is of great interest, namely, the cherry fruit moth (*Argyrethesia conjugella*). This serious fruit destroyer has been previously recorded by Mr. Whitehead from Kent. For some thirteen years I have failed to detect it in Kentish cherry orchards. It has, however, occurred during the past season in one large cherry plantation near Stourport.

The insect is certainly British, but is far more numerous on the Continent, and it is quite likely that it is imported in Continental fruit, but I have only once been able to detect it. It attacks apples, &c., as well as the cherry.

Unknown Black Currant Fruit-Moth.—Lastly, an unknown Lepidopterous enemy has occurred widely in Worcestershire in black currants. It lives inside the black currants and causes the fruit to remain as a dried husk on the bush. It was detected in several gardens and plantations I visited, and had proved a very serious enemy. It is hoped that next year its life-history and identification will be traced.

Plum Fruit Borer.—Amongst Hymenoptera four only have been of any account. One of these is the plum fruit borer (*Hoplocampa fulvicornis*). The larva of this sawfly bores into the green fruitlets and causes them to fall prematurely. It attacks all manner of plums and greengages, and has been recorded from Herefordshire, Worcestershire, and Kent. At present we know of no remedy; all that can be done is to remove the surface soil beneath the trees in winter and bury or burn it and replace it with fresh soil. Fortunately it only seems to attack a few trees in each plantation.

Currant Sawfly.—The currant sawfly (*Nematus ribesii*) has occurred as usual everywhere, but it can easily be kept in hand by spraying or dusting with hellebore. Reports have reached me of its annoying habits from Yorkshire down to Devon.

Slugworm.—The slugworm of the pear and cherry (*Eriocampa limacina*) was not so prevalent in 1906, but was notified from widely-spread localities. Nothing but several repeated dustings with hellebore or one or two sprayings with arsenate of lead does any good, but either method will soon lessen its ravages, which mainly take place in the autumn. Two instances have been reported of the benefit derived by the removal of surface soil in the winter, where Morella cherries growing against walls have been attacked.

Apple Fruit Sawfly.—The apple fruit sawfly (*Hoplocampa testudinea*) has again been a source of much loss in parts of Kent and Herefordshire. In the former county it has in some cases destroyed most of the crop. In the latter it only occasionally occurs in any numbers. Unlike the codling moth

the sawfly larva, which is easily recognized by its greater number of legs, attacks several apples during its growth. Nothing so far has been found to check its increase in plantations; in fact, from what we know of its life-history, the only preventive measures are hand-picking the attacked fruitlets and removal of surface soil, the latter an impossibility in a plantation widely attacked. Some experiments are being conducted to see if bisulphide injections in the soil will kill the larvæ during the winter months. It might be possible by means of lime-washing to sufficiently retard blossoming until the sawflies have mostly hatched out and died. I have been unable to gather any information as to this pest elsewhere than the two counties mentioned.

Pear Midge.—The pear midge (*Diplosis pyrivora*) has been abnormally prevalent in Surrey, but in the Western Counties it has not been so common as usual. In some years this Cecid has destroyed most of the dessert and perry pear crop. The destruction of blossom by frost in 1905 gave them no breeding ground and thus reduced their numbers. The result was that a fair sprinkling of pears matured last year. A similar result was noticed in a large Surrey plantation, where pears were gathered for the first time for some years. It was recorded from Cheshire, Hampshire, Worcestershire, Surrey, Devon, Essex, and Kent in 1906. Unfortunately, it works high up on old perry pear trees, and as it is impossible to deal with these the pest is likely to continue where such old trees occur. It is just as bad where land is cultivated as where the trees are grown in grass. Varied reports have reached me concerning kainit as a remedy; so diverse are they that we may safely assume that the pest has been checked by other causes than the kainit. There is no doubt that benefit can only be derived from any treatment by the concerted action of growers in each district. The best plan is to forego a possible crop by heavily spraying the blossom with arsenates as soon as it shows, before the bees get at it. This will kill it and thus prevent the maturing of the maggots.

Gooseberry Cecid.—From near Ledbury an interesting new attack has been reported in gooseberries. The tips of the shoots and the buds were found to die off. The damage was

attributed to a *Botrytis* fungus, but the real cause was the larvæ of one of the Cecid flies, small orange maggots which have been found in abundance in all the shoots and bushes sent, the *Botrytis* being secondary and only occurring now and again on the dead shoots killed by the orange Cecid maggots. The life-cycle of the insect is now under observation, with a hope of its future identification. A similar enemy occurs in gooseberries in America, but the larvæ attack the berries in summer, and as this has not been observed here, we have probably a quite new insect attack.

Beetles.—Amongst beetles the raspberry beetle (*Byturus tomentosus*) was again very plentiful in plantations in Kent and Worcestershire. It has already commenced to attack the loganberries. The raspberry weevil (*Otiorhynchus picipes*) caused some annoyance in Somersetshire, and the apple blossom weevil (*Anthonomus pomorum*) was complained of in Worcestershire. In Kent it did not seem to be as bad as usual. Ground beetles (*Harpalus ruficornis*) were reported as damaging strawberries in Worcestershire and Surrey, and the same beetle has occurred in large numbers in raspberry plantations in Scotland. From the Cheddar district *Otiorhynchus picipes* has been reported damaging loganberries. A new strawberry pest has made its appearance in Kent; namely, *Anthonomus rubi*, which lays its eggs in the unopened strawberry blossoms and then cuts them off. An account of the life-history of this beetle, which feeds on bramble and dog rose, and is sometimes found on raspberries, has been worked out by Mr. Fenoulhet, of the South-Eastern Agricultural College.

Woolly Aphis.—One of the most serious apple pests is the woolly aphis (*Schizoneura lanigera*). It has been complained of more than ever during the past year from all parts of Britain, and appears at present to be much on the increase.

Several cases have come to my knowledge of diseased stock being sent out by nurserymen. This has not been from neglect, but simply from the fact that it is not generally known or recognized as a pest of the roots of apple trees. Great care is taken in nurseries to keep it down above ground, but this is mere waste of time as long as the under-ground form is allowed to live, as it can and does migrate from roots to trunk

and from trunk to roots, especially during the late autumn to the latter, where much woolly aphis winters. The aphis does a great amount of damage to young and old trees, not only by causing deformities and by weakening the plant owing to loss of sap, but also because trees attacked by this insect are more predisposed to canker than others.

One large grower in Kent has treated no less than 40,000 young apple stocks for this pest by fumigation with hydrocyanic acid gas so as to kill both root and stem form. In spite of the trouble of lifting such a large number it has been well repaid by the disappearance of this blight, which is so injurious to old and young stock and so easily spread from the nursery. Where old trees are attacked we now know that the only plan we can follow is to destroy the subterranean race of aphis by injections of bisulphide of carbon into the soil. Experiments during the past season have shown the benefit of this treatment, which was so remunerative to vine growers on the Continent when phylloxera was devastating the vineyards of Europe. For this treatment Vermorel's injector is of the greatest use, and the same implement can be employed for the destruction of wireworm in other plants, for at present bisulphide of carbon is the only substance known that will kill these larvæ in the soil. Woolly aphis was reported during 1906 from Sussex, Kent, Surrey, Hampshire, North and South Devon, Gloucestershire, Herefordshire, Worcestershire, Huntingdonshire, Essex, Lincolnshire, and Cheshire.

The prunes suffered very severely in 1906 from aphis attack in all parts of Britain. Three species were present in such numbers that they must not only have affected the possible crop left by the inclement weather, but must have materially affected the growth of the trees.

Leaf-curling Plum Aphis.—The leaf-curling plum aphis (*Aphis pruni*) has occurred all over England, frequent complaints having reached me from all fruit-growing areas. From Whimple to North Yorkshire the same statements have come from growers, namely, that spraying does little good. The reason is that the leaf-curling protects the aphides, and, in consequence, spraying is mere waste of time and money. The complete life-history of this aphis is not known. All we do know is that it

lays its eggs on the prunes in autumn, and that from the eggs in the early spring, before the buds burst, dull purplish wingless females appear and produce green young (lice), and it is these lice that at once commence to curl the delicate leaves as they unfold. The remedy is obvious, namely, an early washing with soft soap and quassia, to kill the purple viviparous female before the advent of the green lice. These females have been observed to be very sedentary, and remain fixed under a bud and protected by it to some extent. The trees must be *washed* not *sprayed*. Two trees were treated last spring, both with the same soft soap and quassia wash; one was drenched, the other finely sprayed. The former was not leaf-curved at all, while the latter showed a considerable amount of aphis; both were inhabited by this insect.

Where this aphis goes in the summer we do not know. It certainly leaves the prunes for some other host-plant, as many aphides are known to do. This migration has given rise to the statement that spraying has killed them, the cast skins of the pupæ being taken for dead insects.

Mealy Plum Aphis.—Another aphis is very abundant in Worcestershire, but many growers tell me they do not consider it very harmful. This is the mealy plum aphis (*Hyalopterus pruni*), which does not curl the leaves but loads them on the under surface until they become mealy masses of insect life. Copious honey dew is formed, and this falls on the fruit. In plantations visited last year where any plums did occur they were often seen to be spoiled for market by the black fungoid growth that follows the sticky honey dew. It occurred in some numbers in Herefordshire and also in Devon. In Kentish orchards it was not so bad, occurring only in a few areas and never seriously. All growers seem to have found a difficulty in killing this aphis. All the washes I have tried have signally failed in doing their work. Whilst in Herefordshire this summer, however, Mr. Getting informed me that he had found that by adding liver of sulphur to the soft soap wash they were all destroyed; in his plantations they were to be seen all browned and dead. On reaching home I tried this wash, and for the first time was able to kill the aphis at once. Francis Walker stated that this aphis comes from rushes and is the same as *Hyalop-*

terus arundinis, and I feel certain that the two are the same, just as the spruce gall aphid and larch aphid are the same species. At least I can detect no structural difference, and specimens have developed when transferred from prunes to rushes.

Hop-Damson Aphis.—The third prune aphid is the hop-damson aphid (*Phorodon humuli*), which occurs on damsons and wild prunes in the egg stage in winter, and in the adult stage in spring. From all hop-growing districts this aphid has been reported as abnormally abundant. It is now well known by all hop-growers and fruit-growers that it migrates to the hops from damsons, &c., and becomes the hop louse. Usually there is one main migration from the middle of May to the second week in June, and the damsons are then cleared. Last year they stuck to the damsons right through the summer, and irregular migrations at no definite time took place late into the summer. It is important to deal with this aphid on the damsons by timely spraying. This must be done later than for the "leaf-curler," and earlier than for the "mealy aphid" which has also been seen during the past year on damsons—an unusual occurrence. Even then we have to fight against the broods migrating from wild prunes to the hops, and this we cannot hope to do successfully. This aphid does much damage in damson plantations.

Currant Blister Aphis.—Currants have been less severely attacked than usual, but the currant blister aphid (*Rhopalosiphum ribis*) has been found destructive in one or two Kent plantations during the year, and also in Worcestershire and North Devon.

Apple Aphides.—The apple aphides were less annoying than usual in Kent, but a very bad attack of the apple leaf-curler (*Aphis pomi*) occurred throughout Worcestershire and to some extent in Herefordshire. In Devonshire it appeared to have been less virulent than usual. Great numbers of the back eggs of *Aphis pomi* have been laid this year in Kent. Twigs sent have been often completely covered with the ova. This usually precedes a bad attack in the following year. It is thus very important to have all prunings burnt.

The stem apple aphid (*Aphis fitchii*) was reported again from Kent, and it is now certain that this migrates to corn and grasses on leaving the apples.

Gooseberry Aphis.—A species of aphis at present unidentified, was reported from several areas in all the fruit districts. It is somewhat important otherwise than as a direct enemy, for the curious deformity produced on young wood by it, has, it seems, been taken by incompetent observers to be the work of the fungus known as the American gooseberry mildew.

Strawberry Aphides.—Some complaints have also been received of strawberry aphides. The wild aphis (*Siphonophora fragariella*, Theo.) has been found in Kent and in Huntingdonshire as well as in Herefordshire, and the *Aphis fragariae*, Koch, has been recorded in hot-house plants from Devon, Dorset, and Surrey.

Apple Sucker.—One of the worst apple pests during the past year has been the apple sucker (*Psylla mali*). This insect has undoubtedly increased very rapidly in recent years. It has been sent from practically all apple-growing areas in England, but is most harmful in Worcestershire and in Surrey, then in Herefordshire and Kent. In the first named county quite 70 per cent. of the blossom trusses must have been killed by the suckers last year. In one large orchard near Godalming, in Surrey, the whole blossom had been destroyed. In Devonshire I found it here and there in the north, but it did not seem to have done any great harm. It was also at work in Monmouthshire, Somersetshire, and Gloucestershire during the past summer. This insect can be kept down by spraying with soft soap and quassia at the time they are hatching from the eggs, in spring, but two or three applications are necessary, as it is not always the case that the ova hatch simultaneously. They appear to hatch at different times on the different varieties, and hence the difficulty of spraying satisfactorily.

A series of experiments is being conducted by the Worcestershire County Council, under Mr. Furley, to endeavour to find some winter wash that will destroy the eggs. So far we know of nothing that will destroy them, and it is extremely doubtful if anything will be found which will not at the same time harm the shoots. One grower, however, informs me that last year he stopped the sucker by spraying with lime and salt just about the time the buds were swelling, and by spraying continuously until they were bursting. The wash seems to act mechanically

and prevents the egg shell from rupturing. As no damage was done in the plantation and as no eggs of the *Psylla* can be found on the limed trees this winter, whilst they swarm on the rows not washed, this will probably prove to be the solution of the difficulty. A fuller report on the general effects of complete lime washing will be issued this spring.

Leaf-Hoppers.—Leaf-hoppers (*Typhlocybidæ*) belonging to three species, namely, *Chlorita flavescens*, Fabricius, *Chlorita viridula*, Fallen, and *Typhlocyba quercæ*, Fallen, were abnormally abundant in 1906 in parts of Kent, Devon, and Worcestershire.

No previous records are known of these insects doing damage in this country to fruit trees, but several growers have informed me that they have on previous occasions been very annoying, and that they check the growth of the trees.

The effect of these leaf-hoppers in 1906 was to produce a silvery grey or marbled appearance of the leaves of plums and apples, due to their constant sucking away of the sap from below the leaves. So great was this attack in some orchards that certain trees looked at a distance as if they were suffering from "silver-leaf." One grower in Kent reported that the "hoppers" were in such swarms that the pickers had to stop work owing to the insects getting into their eyes, nose, mouth and ears.

A good washing with soft soap and quassia, or paraffin wash, was found to destroy them in the nymphal stages, but the only way to destroy the winged hoppers is to knock them off the trees with soft soap wash and then spray them with a 25 per cent. paraffin emulsion when on the ground. From several localities the yellow leaf-hoppers (*Chlorita*) were found to be largely parasitized by *Proctotrupids*, and also a few of the spotted leaf-hopper (*Typhlocyba quercæ*, Fal.) were similarly affected.

Brown Currant and Gooseberry Scale.—From Herefordshire, Kent, and Worcestershire, complaints reached me of the brown currant scale (*Lecanium coryli*), in all instances on gooseberries. This pest has been further reported as being readily checked by winter spraying with caustic alkali wash.

White Woolly Currant Scale.—The white woolly currant scale (*Pulvinaria vitis*, var. *ribis*) also occurred again in Huntingdonshire, near St. Neots, and was also reported from near Worcester.

Oyster-shell Bark Louse.—Plum trees were found badly attacked by the oyster-shell bark louse (*Aspidiotus ostræiformis*) near Ross, in Herefordshire; and near Ombersley, in Worcestershire. In both cases the trees were cut down and burnt, as they were smothered with the scales and dying. It also occurs in Kent fruit plantations. Mr. F. Smith recently informed me that it is found here and there in the Maidstone area. Another grower sent the same insect, which was covering plum trees near Sittingbourne. Although it does not spread very rapidly, it soon covers a tree it once settles upon, and the fate of the tree is then assured, unless it is treated with paraffin emulsion in winter.

Mussel Scale.—By far the worst scale insect on fruit trees is the mussel scale (*Mytilaspis pomorum*), which has been sent to me no less than fifty times during the past summer. It has undoubtedly increased enormously during the last four years, and may be found in all parts of Great Britain. One young tree was seen in Worcestershire in which it was almost impossible to find a piece of the bark, so thickly had the "scales" encrusted it. Needless to say the tree was dead. One note has been sent me saying that *Chalcid* parasites had materially checked it, but in the majority of specimens sent no sign of these insects could be found. So far, the only treatment seems a heavy spraying with strong paraffin emulsion or with Mr. Spencer Pickering's wash of paraffin with caustic soda in winter or dilute paraffin emulsion when the eggs are hatching out in June. Mr. Collinge wrote me in June last that he was destroying it in millions with caustic alkali wash. In Kent, and also at Woburn, this was found to have no effect; thus showing how different washes have diverse effects in separate localities.

A Shield Bug on Cherry.—From St. Ives, Huntingdonshire, the large shield-bug (*Tropicoris rufipes*) was reported as occurring in large numbers on cherry trees, and causing damage. This common bug has not before been noticed as a fruit tree enemy.

Big Bud Mite.—The big bud mite (*Eriophyes ribis*) has, as usual, been very harmful, but by persistent hand picking in December and January it has been kept in check in many plantations and I have seen them quite cleaned by this method.

So far the Boskoop giant resists the mite owing to its strong growth, but it is by no means immune.

There does not seem to be much of this pest in Hampshire, and in parts of Worcestershire and Herefordshire, and also in Kent, I saw many clean patches in 1906.

An interesting attack of this mite has been found in Kent, the acari invading red currants, producing great masses of distorted buds and a thick swollen appearance of the whole shoot. Another grower wrote saying his red and white varieties had been attacked in Thanet.

From Newcastle some buds were sent which were being eaten out by the caterpillars of the tortrix moth (*Tortrix podana*, Scop.), and from Greenhithe a plantation was found to have the majority of the buds tenanted by a small *muscid* larva that was devouring the mites. Cob nuts were also attacked more than usual in 1906 by *Eriophyes avellanae* in Kent, and were also seen badly infected in Sussex. This mite is increasing in nut plantations, and is commencing to do some harm.

Red Spider.—Red spider (*Bryobia pretiosa*) has been present in most districts on gooseberries, but not generally in any quantity, and in two cases apple trees have been infested with an allied species.

Strawberry Eelworm.—Quite a serious attack on strawberries has been made by the eelworm (*Aphelenchus fragariae*, Ritzema Bos). Originally it was recorded by Miss Ormerod from St. Paul's Cray, in Kent, where it has occurred again during the past year. In addition, specimens and complaints have been received from other parts of the county, and from Worcestershire, &c. Great damage has been done to strawberry plants during the past year in various parts of the country by these worm parasites, but in many samples sent for report disease was due to some other cause than animal injury, and could not be discovered at the time. The curious cauliflower-like growth produced in attacked strawberry plants at once places the cause of the eelworm disease beyond doubt, but the eelworms are found in plants which show no signs of their attack when present in small numbers.

Slugs Attacking Gooseberries.—Near Ledbury serious damage to the blossom and young fruitlets of the gooseberry was

traced to slugs by Mr. John Riley, of Putley Court. Similar injury occurred in plantations near Evesham, but it appears to have been attributed to frost by local growers.

The Blackbird.—A very serious pest in fruit plantations during the past year has been the blackbird, which caused endless loss in bush and orchard fruit, especially in Kent, Herefordshire, and Worcestershire. There is no doubt that this bird has unduly increased in numbers in recent years. Its ravages were particularly noticed in apple plantations.

FRED. V. THEOBALD.

THE VALUE OF POULTRY MANURE.

Whilst it is recognized that proportionately to the weight of fowls and to the amount of food consumed the quantity of manure produced by the various species of poultry is of considerable importance to farmers and other cultivators, the data available are very incomplete. Until recent years, with few exceptions, fowls were kept upon farms to so limited an extent that the value of their manure was of minor consideration, but with increased numbers the position is rather different. For the purpose of throwing further light on this question, a series of observations has been made during the past twelve months at the College Poultry Farm, Theale, and analyses of various samples of manure have been made by Mr. J. W. Taylor, Agricultural Chemist at the University College, Reading, on which estimates as to their relative values can be based.

Arrangements.—In order to ascertain the average amount of manure produced by individual birds, several observations have been made, the results of which are remarkably uniform. The specimens selected for this purpose were taken from the ordinary stock upon the College Poultry Farm. Excepting in the case of those put up for fattening, they had not been specially fed, but were average birds. In the case of A, B, and C, these were taken direct from the grass fields to the cages, where they were allowed to remain twenty-four hours before any record was made, in order that they might settle down to their new conditions. The cages were provided with dry wooden floors, on which the manure remained, and no sand or soil was used as

covering. The droppings were gathered once each day and weighed immediately, so that the loss of moisture by evaporation was very slight. In each instance the observations were made for a complete week.

Fowls Tested.—For the purpose of this experiment four fowls were used, as follows :—

- | | | | | |
|---------------------|--------|---------------|-----|------------|
| A. Wyandotte cock, | weight | 6 lb. 12 oz., | age | 16 months. |
| B. Faverolles hen, | „ | 5 lb. 12 oz., | „ | 15 „ |
| C. Growing chicken, | „ | 3 lb. 12 oz., | „ | 14 weeks. |
| D. Fattening bird, | „ | 3 lb. 8 oz., | „ | 15 „ |

As already mentioned, the three first named were taken off the grass, where the two former had been used for some months as breeders, and the last (D) out of the fattening cages. In this case the test commenced on the second day of cramming, that is, the twelfth day after the beginning of the fattening period.

Feeding.—During the test the feeding was exactly the same as under ordinary conditions, with the exception that, as the fowls were in strict confinement, they could obtain no natural food. It is a question as yet undecided whether this would tend to increase or decrease the quantity of manure produced. Probably any difference either way would be very small indeed, although the lack of exercise would tend to decrease the amount of food consumed, with consequent reduction of the excreta. A, B, and C were fed each day at 7.30 a.m. on soft food, consisting of barley meal, toppings, and bran in equal parts, prepared by cooking and supplied in a fair ration, any left being removed within a reasonable time; at 12.15 p.m. they had a little wheat and barley and a plentiful supply of green food; at 4.30 p.m. they had as much barley and wheat as they cared to eat. Water was supplied at each time of feeding. D was crammed twice a day with Sussex ground oats mixed with skim milk, but no green food was given. It will be seen that none of the birds received any meat or food of a stimulating nature, and the diet was such as is common among poultry-keepers in this country.

Quantities of Manure Produced.—During one week (in the month of June) the weights of manure produced by the respective birds were as follows :—A, 1 lb. 13 oz.; B, 1 lb. 11½ oz.; C, 1 lb. 2½ oz.; D, 1 lb. 13¼ oz.

It is interesting to note that the manurial products in comparison with the weight of body in each case for one week work out thus :—

A.	Produced manure equal to	26.3	per cent. of body weight.			
B.	"	"	"	29.6	"	"
C.	"	"	"	30.8	"	"
D.	"	"	"	52.2	"	"

from which it will be seen that where fattening foods are used there is a great increase of manure, and, as shown below, not alone in the shape of moisture, as the excrement is richer than under ordinary conditions.

The figures with reference to D would only apply to a very short period, as such birds are as a rule not fattened for more than three weeks. But those relating to A, B, and C enable us to form an estimate as to the annual production, although that might be modified to some extent by the season of the year, but in the tests made at three periods the differences were small. Taking the two birds which would be representative of breeding or laying stock, we find that on the above basis A would produce in twelve months manure of the total weight of 94 lb. 4 oz., and B a total weight of 88 lb. 9 oz.; or, to put it another way, rather less than twenty-four fowls of the weight of A would yield a ton of moist manure in a year, and twenty-five fowls of the weight of B would give nearly the same quantity in that time. In respect to the dry matter, A would produce in twelve months a total weight of 38 lb., and B a total weight of 36 lb. Thus fifty-nine fowls of the weight of A would produce a ton of dry matter in a year, and nearly sixty-three of the weight of B a ton in the same time. Our observations with adult stock show that the quantity produced varies with the size of the bird. It would add to the value of these observations if lighter and heavier birds respectively were tested, and it is hoped that this will be done at some future time. But it is interesting to note that the hen B gave, in relation to her own weight, 2.8 per cent. more manure than did the male A, and it is probable that as light-bodied fowls are more active and better foragers the differences will not be so great as might be anticipated. Thus a farmer who has a hundred hens and six males would obtain from them in the course of twelve months four tons of fresh manure. In the case

of growing chickens, upon the basis of C we estimate that each produces to the age of thirteen weeks 5 lb. 5 oz. of manure, and if then fattened would have yielded at the time of killing 10 lb. 13 oz. Further, if instead of fattening such chickens they were allowed to grow, they would by the time they reached twenty-six weeks have yielded 25 lb. 5 oz. of manure each. The cash values are given later.

Ducks, Geese and Turkeys.—Similar observations have also been made with ducks, geese, and turkeys, but for various reasons they have not been carried out so completely. Enough, however, has been done to indicate the quantities produced by adult birds. The question of young stock must be left over for future experiments.

For this purpose a large Aylesbury duck, weighing about 7 lb., a cross-bred goose, and a Bronze turkey were selected. The last named was a growing cock weighing 17 lb. The manure produced was as follows :—Duck, 6 lb. 10 $\frac{3}{4}$ oz. per week ; goose, 10 lb. 1 oz. per week ; turkey, 4 lb. 1 $\frac{1}{2}$ oz. per week.

Upon this basis it will be seen that an adult duck, of the size named, would produce in the twelve months 346 lb. 14 oz. of fresh manure, or 76 lb. 5 oz. of dry matter. Thus 6 $\frac{1}{2}$ ducks would give a ton of fresh manure annually, and twenty-nine ducks a ton of dry matter.

An adult goose at the same rate would produce in the twelve months 523 lb. of fresh manure, or 91 lb. of dry matter ; thus four geese would produce nearly a ton of fresh manure, but, by reason of the large proportion of moisture in goose manure, twenty-four birds would be required to yield nearly a ton of dry matter.

A turkey of the weight named would produce in the twelve months 212 lb. of fresh manure, or 53 $\frac{1}{2}$ lb. of dry matter. Thus 10 $\frac{1}{2}$ turkeys would produce a ton of fresh manure, or forty-two turkeys a ton of dry matter.

Analysis of Manure.—For the purpose of analysis, samples were taken from the ordinary fowls and not those produced by the birds kept shut up for the testing of quantities. Those shown in I., II., III., IV. were from stock at the College Poultry Farm, Theale, and for V. (goose) and VI. (turkey) we are indebted to the courtesy of Messrs. Abbot Bros., of Thuxton, Norfolk, the well-known poultry breeders. For comparison we include

(VII. and VIII.) analysis of manure from chickens at one and three months respectively.

COMPOSITION OF POULTRY MANURE.

	Fresh sample.	Air-dried sample.
	Per cent.	Per cent.
I. Manure from Birds at liberty.		
Moisture	59.5	9.56
Dry Matter	40.5	90.04
Containing Nitrogen	1.75	3.99
" Phosphoric Acid (P_2O_5)	1.00	2.27
" Potash (K_2O) ... ..	.54	1.22
II. Manure from Birds in confinement.		
Moisture	68.3	9.5
Dry Matter	31.7	90.5
Containing Nitrogen	1.47	4.21
" Phosphoric Acid (P_2O_5) ... ..	.71	2.04
" Potash (K_2O) ... ..	.49	1.4
III. Manure from Fattening Birds.		
Moisture	70.3	15.0
Dry Matter	29.7	85.0
Containing Nitrogen	2.28	6.52
" Phosphoric Acid (P_2O_5) ... ..	.97	2.77
" Potash (K_2O) ... ..	.55	1.57
IV. Manure from Ducks at liberty.		
Moisture	78.0	10.0
Dry Matter	22.0	90.0
Containing Nitrogen	1.2	4.90
" Phosphoric Acid (P_2O_5)	1.09	4.46
" Potash (K_2O) ... ..	.39	1.6
V. Manure from Goose at liberty.		
Moisture	82.6	9.1
Dry Matter	17.4	90.9
Containing Nitrogen ... ..	.53	2.8
" Phosphoric Acid (P_2O_5) ... ..	.19	.97
" Potash (K_2O) ... ..	.34	1.8
VI. Manure from Turkeys at liberty.		
Moisture	74.7	8.0
Dry Matter	25.3	92.0
Containing Nitrogen	1.02	3.7
" Phosphoric Acid (P_2O_5) ... ..	.66	2.4
" Potash (K_2O) ... ..	.47	1.7
VII. Manure from Chickens one month old.		
Moisture	72.81	11.0
Dry Matter	27.2	89.0
Containing Nitrogen	1.71	5.56
" Phosphoric Acid (P_2O_5) ... ..	.48	1.56
" Potash (K_2O) ... ..	.43	1.4
VIII. Manure from Chickens three months old.		
Moisture	77.7	11.1
Dry Matter	22.3	88.9
Containing Nitrogen ... ..	.9	3.61
" Phosphoric Acid (P_2O_5) ... ..	.35	1.44
" Potash (K_2O) ... ..	.28	1.14

Value of Manures.—Taking the quantities of manurial constituents in the above samples, and estimating their value on the following basis—

Nitrogen	...	...	12s. per unit (<i>i.e.</i> , 1 per cent. per ton)
Phosphoric Acid	...	...	3s. „
Potash	...	...	4s. „

we arrive at the relative values when in moist and air-dried conditions respectively :—

ESTIMATED VALUES OF FRESH MANURE PER TON.

—————	Nitrogen.		Phosphoric Acid.		Potash.		Totals.	
	s.	d.	s.	d.	s.	d.	s.	d.
I. Fowl at liberty ...	21	0	3	0	2	2	26	2
II. Fowl in confinement ...	17	8	2	2	2	0	21	10
III. Fattening fowl ...	27	4	2	11	2	2	32	5
IV. Duck ...	14	7	3	3	1	7	19	5
V. Goose ...	6	4	0	7	1	4	8	4
VI. Turkey ...	12	3	2	0	1	11	16	2
VII. One month chicken ...	20	6	1	5	1	9	23	8
VIII. Three months' chicken ...	10	10	1	1	1	1	13	0

ESTIMATED VALUES OF AIR-DRIED MANURES PER TON.

—————	Nitrogen.		Phosphoric Acid.		Potash.		Totals.	
	s.	d.	s.	d.	s.	d.	s.	d.
I. Fowl at liberty ...	47	11	6	10	4	11	59	8
II. Fowl in confinement ...	50	6	6	1	5	7	62	2
III. Fattening fowl ...	78	3	8	4	6	3	92	10
IV. Duck ...	58	10	13	5	6	5	78	8
V. Goose ...	33	7	2	11	7	2	43	8
VI. Turkey ...	44	5	7	2	6	10	58	5
VII. One month chicken ...	66	9	4	8	5	7	77	0
VIII. Three months' chicken ...	43	4	4	4	4	7	52	3

It will be understood that these figures are arrived at by assuming that the unit value of the constituents of poultry manure is approximately the same as the unit value of the chief artificial fertilisers. This point will need further investigation, but the estimated values given above serve to indicate that poultry manure has a considerable money value.

The percentage of moisture in the fresh samples explains to some extent the variations in value. Goose manure shows 82·6 per cent. of moisture, but in addition the fertilizing elements are low, although the sample was taken from adult birds in the month of March. Turkey manure is also not equal to that

from fowls or ducks. An interesting point is the large amount of phosphoric acid found in duck manure, which, together with the nitrogen, explains why pastures upon which these birds are kept afterwards produce the finer grasses. The tendency of nitrogen is to stimulate the growth of the grasses, the coarser of which tend to crowd out the finer grasses as well as the clovers; whilst phosphoric acid promotes growth of the clovers. Practical experience has shown the great value of duck manure in the improvement of pastures.

Relative Values.—By comparison of the figures already given as to quantities produced by A and B, and the values as revealed by analysis, it will be seen that in the case of stock at liberty the average value of the manure per fowl is 1s. 1d. per annum. Hence, as experience has shown that at least forty birds can be kept on an acre of land without interference with growth of herbage or danger of disease in the birds, and a larger number on arable land, the manure produced, where the land is cropped in rotation, would more than pay the rent during the time of occupation. Where portable houses are used, more especially those without floors, no special care need be taken, as the manure will be evenly distributed, but where gathered from permanent buildings it is necessary to preserve it as described below. From the analysis of I. and II. it will be seen that the latter contains very much more moisture, but the air-dried samples differ to a very small extent either in composition or value.

As might be expected, the value of the manure from birds caged for fattening is high, owing to the nature of the food supplied. As these birds are only kept in this way for three weeks, no estimate can be made on the annual basis. In three weeks, as seen above, a fattening fowl produces 5 lb. 8 oz. of moist manure, or of dry matter 1 lb. 10 oz. On this basis the value of the manure of each bird during the fattening stage of its existence works out at 0.95d., from which it may be estimated that 408 fowls undergoing this process will produce a ton of moist manure of the value of £1 12s. 5d. If to the excreta is added that produced during the growing period, it will be seen that up to the time of killing (sixteen weeks) each bird gives nearly 10 lb. 13 oz. of moist manure; its value will be 1.88d.,

and thus every 100 birds reared and fattened should be worth to the farmer in this way the sum of 15s. 8d.

In the case of growing birds it is a little more difficult to estimate, but on the basis previously laid down it was shown that up to six months old a chicken of the larger breeds will produce 25 lb. 5 oz. of fresh manure, which, according to analyses I., VII., and VIII., would represent a manurial value of 28d. Thus every 100 chickens raised to the age stated should produce manure of the value of £1 3s. 4d.

Assuming the life of fowls used for breeding or laying stock to be 2½ years, the manurial return in that time would be :—

	s. d.	
First six months	0	2·8
Seven to eighteen months	1	1
Nineteen to thirty months	1	1
Total	2	4·8

Taking the quantity of manure produced and the values as revealed by analysis, it is found that the value of the manure per head per annum of other adult stock is as follows :—Ducks, 3s. per annum ; geese, 2s. per annum ; turkeys, 1s. 6d. per annum.

The lower values of goose and turkey manures, considering the large quantities produced, may be explained by the fact that these birds obtain a much larger proportion of natural food than ordinary poultry.

Treatment of Manure.—Where manure as produced falls directly on to the ground, whether arable or pasture, it may be assumed that the full value is obtained if the land is cropped in due rotation. Otherwise it is necessary to see that it is properly stored and dried. To leave it in a heap in the open is certain to lead to deterioration of its essential qualities, both from washing away of soluble materials by rain and by fermentations which set free ammonia and other volatile nitrogenous substances. Fowl excreta form a distinctly nitrogenous manure which stimulates vigorous growth of the leaves, stems and roots of plants generally as much as a dressing of nitrate of soda or sulphate of ammonia. It contains, however, in addition to nitrogen, an appreciable amount of phosphates and potash in a rapidly available form, and on this account is a good complete manure. Its value as an all-round fertilizer for all kinds of crops can be materially enhanced by mixing it

with mineral superphosphates at the rate of one part of the latter to five or six parts of the fresh manure.

Such as have a demand for it in a pure state should spread it thinly on trays in a shed, so that it will dry and yet retain its elements. These trays can be built in stacks. In this form fowl manure is valuable for farmers, fruit growers and gardeners alike. It is also used for tanning. In the fattening districts of Southern England there is a demand for air-dried manure at £2 10s. to £3 per ton, which fairly represents its value, as it has usually a moderate proportion of sand or earth mixed with it. Wherever feasible it should be stored in a covered shed. When dried, the compost named above can be used at the rate of 6 or 8 cwt. per acre of cultivated or fruit land. A useful plan is also to mix two parts of moist poultry manure with one part of ordinary soil by weight. In this case alternate layers should be made of earth and manure, leaving the whole until both have dried when it is ready for use.

EDWARD BROWN.

WILL BROWN.

THE FATTENING OF CALVES FOR VEAL.

Veal has long been a favourite article of diet, and this demand has caused many farmers to fatten off their calves for veal instead of rearing them. Especially is this the case in the neighbourhood of large towns. On some of these farms it is the custom to sell all the male calves for veal and rear the heifer calves for breeding purposes. The calves, when being fattened for veal, may be fed on whole milk, or substitutes for whole milk may be largely used during the later stages of fattening, but in this article it is the intention of the writer to deal with the fattening of calves on whole milk.

Calves fattened for veal sometimes receive whole milk during the first six, eight or ten weeks of their life, but eight or ten weeks is a long time to keep them on such an expensive diet as milk; very often the milk would yield a better return if manufactured into cheese or butter, because we may take it that 6d. per gallon is the maximum return which can be expected, without taking labour, &c., into consideration, from milk, when turned into veal.

Suitable Type of Farm.—One type of farm seems to lend itself remarkably well to calf-fattening for a limited period in the spring, viz., the farm on which cheeses are only made during the warmer months of the year. In the early spring of the year the supply of milk is comparatively small, and this, together with the extra heating required by both milk and curd, makes cheese-making more difficult in the early spring than in the warmer months of the year. Another thing to remember is that veal—in Lancashire at any rate—commands a high price before Easter, but the price falls considerably as soon as Easter is past. The above considerations seem to favour the practice of feeding calves for veal, provided that it is done at a time when veal commands a high price, and that fattening is done so rapidly that the calves are kept on whole milk for a minimum length of time.

Preparation of Calf-box.—It is necessary to make some reference to the preparation of the calf-box before the introduction of the calf, because, unless this point is attended to, the work may be very unprofitable owing to the calves being attacked by “white scour”* or some similar disease. The box should be cleaned out, the floor disinfected, and the walls lime-washed. The ventilation should be thorough, in order to secure a gentle current of fresh air through the box. Light in the boxes will do no harm, but a great deal of good if it is not too strong. If these three conditions are fulfilled, viz., light, fresh air, and cleanliness, the calf may be safely introduced on to a comfortable bed of clean straw. An example from the writer’s experience will emphasize the importance of carefully preparing the calf-box. Several years ago the calves on a farm in Lancashire had a “bad run.” When they were about two days old their eyes appeared sunken, they scoured, refused their milk, became prostrated, and very quickly died. A number of calves were lost in this way, but it was noticed that those in a particular box remained quite healthy, while practically all the others died, and as this box was better lighted and better ventilated than the others it was resolved to try the effect of lighting and ventilation on the disease. Windows were built in the walls and arranged so that the ventilation could be regulated,

* See Board of Agriculture Leaflet No. 101, “White Scour in Calves.”

with the result that by careful disinfection in addition, the disease was entirely stamped out. In fact, the sudden change for the better was very marked.

Feeding the Young Calf.—Great care has to be exercised in the feeding of young calves during the first few weeks of their lives if they are to increase in weight at a maximum rate in a minimum time. The writer has frequently noticed that a calf drinks too much during the first day or two of its life unless the quantity is regulated; then about the third day it turns sickly, scours, and practically refuses more milk for a day or two. This gorging of the calf's stomach with milk during the first day or two, or even when the calf is older, seems to bring on "scouring." To test the converse, a calf was given a carefully regulated diet, and so far as this calf was concerned scouring did not occur. It was an average-sized calf of the Shorthorn type and a good thriver, and a table is here given showing the amount of milk consumed by it, which will act as a guide to the quantity which can be given with safety.

TABLE:—Showing milk consumed in lb. by Barbara's Bull-calf. Born 20th March. Sold when 28½ days old. Calf weighed on Mondays just before mid day meal. Fed three times per day. M. = Morning; No. = Noon; Ni. = Night.

Tues.			Wed.			Thurs.			Fri.			Sat.			Sun.			Mon.			Milk consumed in lb.	Total live weight of calf in lb.	Increase in lb. per week.
M.	No.	Ni.	M.	No.	Ni.	M.	No.	Ni.	M.	No.	Ni.	M.	No.	Ni.	M.	No.	Ni.	M.	No.	Ni.			
															1	1	2	2	2	3	11	89	
4	4	6	6	3	8	6	3	7	9	3	8	9	3	8	8	0	4	5	3	6	113	101	12
6	4	7	8	4	8	8	4	7	8	4	8	9	4	8	9	4	10	9	4	10	139	114	13
10	4	12	10	4	12	10	0	11	12	4	12	12	4	12	12	4	12	12	4	14	187	138	24
11	4	12	12	4	12	12	4	12	12	4	12	12	5	12	12	5	13	12	Sold		182	149	21
Totals																			...	...	632*		70

* In this case 9 lb. of milk have given 1 lb. of increase.

Feeding Limits.—The feeding limits beyond which it is not advisable to go with an average calf are:—

16 lb. per day by the end of the first week.

23 lb. per day by the end of the second week.

28 lb. per day by the end of the third week.

30 lb. per day by the end of the fourth week.

Three gallons per day is as much as a calf can comfortably take at a month old, and in all cases the milk should be served to the calf freshly drawn from the mother, if at all possible.

Castor Oil and "White Scour."—As soon as a calf begins to scour, or even before if it looks at all sickly, it should receive a tablespoonful of castor oil in warm milk. With this treatment the calf will often take the next meal heartily, but if allowed to run on unchecked, complications may set in which will prove fatal. An error in diet is probably the commonest cause of "scour." The important point is to check the disease in its early stages.

Buttermilk.—Many calf-feeders maintain that calves receiving buttermilk along with the sweet milk generally weigh well, and the writer's experience seems to support that idea. The calf in the above table received a small amount of buttermilk during the third week, the proportion being gradually increased till it was about one of buttermilk to ten of new milk; this was continued till the calf was sold. A glance at the above table will show the striking increase during the third and fourth weeks; the acidity of the buttermilk seems to stimulate the appetite.

Advantage of Feeding Calves often.—A newly-born calf has only a small stomach and requires small quantities of milk at a time, but often, if we are going to follow Nature's way. It is certainly not advisable to feed a calf only twice a day during the first month or six weeks as is sometimes done. A calf fed three times a day will be quite as heavy, if not heavier, at a month old as one five weeks old which has been fed only twice a day. About $9\frac{1}{2}$ lb. whole milk will give 1 lb. of increase in the former case, while to give the same amount of increase in the latter $10\frac{1}{2}$ to 11 lb. will be required. The calf fed twice a day is marketed at least a week later, which in a falling market means that a halfpenny to one penny per lb. less would be received for the veal. This is important, as 1d. per lb. less for the veal would mean 8s. less for a calf weighing 160 lb. live weight.

Fattening Calves versus Cheese-making.—By feeding calves three times a day approximately $9\frac{1}{2}$ lb. of milk are required to give 1 lb. of live weight increase or 6 lb. of veal (carcase weight 60 %). Multiplying both by $10\frac{1}{4}$ (the weight of 1 gallon of milk)

we find that 97·37 lb. of milk give 6·15 lb. of veal. Now 97·37 lb. of milk would give $9\frac{1}{2}$ lb. of cheese (taking 1 gallon of milk to give 1 lb. of cheese), therefore 6·15 lb. of veal and 9·5 lb. of cheese are equivalent quantities as far as milk required is concerned. Taking veal at 9d. per lb. this would be the same as getting 5·82 pence per lb. for the cheese without taking labour, &c., into account. It must not be forgotten that the colostrum, although suitable for calf-feeding, could not be used for cheese-making; a point which makes calf-feeding compare better with cheese-making than is at first apparent.

Fattening Calves versus Butter-making.—Again assuming that $9\frac{1}{2}$ lb. of milk is sufficient to give 6 lb. of veal, and that $2\frac{1}{2}$ gallons of average Shorthorn milk yield 1 lb. of butter, then with veal at 9d. per lb. the butter from the same amount of milk must realize 14·56 pence per lb. The colostrum also would not be used for butter-making, although quite suitable for calf-feeding. No account is taken here of the buttermilk or, in the case of cheese, the whey, because it will need this to balance the extra labour involved in both cheese-making and butter-making.

Conclusions.—It may be taken that 9d. per lb. for veal, 6d. per lb. for cheese, and 1s. 3d. per lb. for butter are very approximately equivalent quantities. This will only apply where the three processes are carried out equally well. Sixpence per lb. is not difficult to get for cheese, and 9d. per lb. is as much as can be expected for veal: this shows that when veal drops in price 1d. per lb. that it will no longer compare favourably with cheese-making. Butter, on the other hand, may fall considerably below 1s. 3d. per lb., and on this account vealing calves will often pay as well as butter-making.

Probably a month is as long as it is advisable to feed calves on whole milk on a dairy farm, or until they have reached about 160 lb. live weight, or 96 lb. of veal. This weight may be attained in a month, provided the calves are fatted as quickly as possible; but one cannot expect to do it unless the calves are fed three times a day. An effort should also be made to have the calves fat at the time veal commands a high price; otherwise the returns from vealing calves on whole milk may not be at all satisfactory.

JOHN PORTER.

In Great Britain the mangold (*Beta vulgaris*) is chiefly cultivated in the southern and midland counties of England,

The Cultivation of Mangolds.

since it requires a warm, somewhat dry, climate. The mangold grows best upon rich loams or upon such peaty soils as are found in the fens; but in a suitable climate it is not very exacting as regards soil, and good crops may be grown upon light loams or upon stiff clays. In general it succeeds better upon stiff than upon light land. Under favourable conditions the mangold crop is one of the most valuable that a farmer can grow. As a food for dairy cows, for ewes after lambing, and even for pigs and poultry, mangolds are of great value, and, as they store well, they provide an admirable crop for summer use. Pulped and mixed with chaff, and fed in conjunction with cake and meal, they form an excellent winter ration for keeping up or increasing the milk yield. The ration fed may vary widely with the season of the year and with the quantity available. For dairy cows from $\frac{1}{2}$ cwt. to $\frac{3}{4}$ cwt. per head per day would be an ordinary allowance; and full grown fattening cattle would usually receive from $\frac{3}{4}$ cwt. to $1\frac{1}{4}$ cwt. in the Eastern counties.

The varieties commonly grown are the white-fleshed or Yellow mangolds, the yellow-fleshed, Golden or Orange mangolds, and the pink-fleshed Red mangolds, these being divided according to shape into Globe, Intermediate, Tankard, and Long varieties.

The mangold is essentially a food rich in sugar, the total dry matter averaging about 12 per cent., of which nearly two-thirds will consist of sugar. The composition, however, varies considerably. Small roots on the average are somewhat richer in dry matter than large specimens. Certain changes take place in storing which render the roots more suitable as a food for stock, and they are therefore usually kept over winter until the early months of the year. They may, however, be fed to stock from October to November onwards—though not so suitable at this period—until the end of the following summer.

Preparing the Seed-bed.—As one of the root or fallow crops, mangolds follow a corn crop. They allow the ground to be thoroughly cultivated and cleaned, and as they are deep rooting they materially assist in getting the land into good "heart" for the succeeding corn crop. If the land is at all foul with weeds,

autumn cultivation should be directed to cleaning, after which long manure should be carted on during dry weather and the land ploughed deeply for the winter. In some cases, however, the land is laid up in ridges. Dung may, if desirable, be applied in spring, but should then be in the "short" or rotten condition. For seeding purposes a deep, mellow tilth is required, and to this end spring cultivation takes the form of ploughing, scuffling or cultivating, and harrowing, all perennial weeds being drawn out. The result should be that a fine seed-bed is prepared, but care must be taken not to over-dry the soil, and if the soil is clean it is desirable to prepare the ridges a fortnight or more before sowing the seed. If dung is to be applied in spring (1) the land may be ridged, and the dung spread, after which the ridges must be split back, or (2) when sowing is to take place on the flat the dung may be ploughed in in the ordinary way. Spring manuring is not well adapted to dry districts, however, and if mangolds are sown on the flat the dung should have been ploughed down during the previous autumn or winter.

Seed and Sowing.—Mangold seeds as they occur in commerce consist of clusters of several true seeds embedded in a woody capsule, and this explains why several plants come up in a group, rendering careful thinning so necessary. The germinating capacity of mangold seed should be not less than 120.

Mangolds are usually sown between the beginning of April and the middle of May. Except in those districts which are exposed to late frosts, or in which mangolds are liable to "bolt," the earlier in April the sowing is done the better are the prospects of the crop. Three to 6 or 10 lb. of seed are sown per acre, according to the system of sowing, the quantity being least when dibbled. In most cases sowing on the ridge is to be recommended, but in dry districts or on light soils the "flat" system is preferable. Seed may be drilled in the first case by means of small drills covering two ridges at a time, with rollers before and behind the drill coulters, while on the flat an ordinary corn drill is employed. For small areas dibbling may be resorted to. The rows are usually from 26 to 29 in. apart when mangolds are sown upon the ridge, and from 22 to 26 in. apart when sown on the flat. In dibbling, 1 ft. apart in the rows is about the distance for sowing, two or three "seeds" being placed in each

hole. Mangold seed should not be sown deeper than $\frac{1}{2}$ to 1 in. A roller should follow the drill when seed is drilled on the flat, and as a firm seed-bed is necessary, ridges should also be rolled if the soil is loose or open.

Subsequent Treatment.—As soon as the young plants are well up the horse-hoe should be set to work, and all weeds must be kept down between the rows by repeating the hoeing until the wide-spreading leaves or the growth of the roots would render further treatment in this way harmful. Hand-hoeing also must be sufficiently frequent to keep down weeds between the plants in the rows. "Singling" commences as soon as the plants are well established, and usually from six weeks to two months after sowing. The plants are set out 12 to 14 in. apart, the lesser distance when the rows are over 2 ft. apart. Some skill is necessary to carry out this operation, since several plants may grow from one "seed," and a second singling may be requisite.

Top-dressing the crop with 1-1 $\frac{1}{2}$ cwt. nitrate of soda is frequently practised when the crop is about two months old, or two half-dressings may be given at a few weeks' interval.*

Pulling.—Harvesting of the mangold crop takes place during October or early November, after yellowing of the leaves. The quantity to be lifted may vary from 15 to 50 tons per acre, from 20 to 30 tons being usual. Mangolds are pulled up by hand, the leaves are *twisted off* to minimise "bleeding," and the roots are then thrown into heaps and covered with the removed leaves.

Storing.—Being very liable to injury by frost, mangolds must be carefully covered. They may be stored in large quantities in pits or clamps. The roots are first arranged in a long triangular prism—about 6 ft. wide at the base. This "clamp" is then covered thinly with straw or bracken, this in turn being covered with 9 in. of soil dug from all round the clamp, which is thus left standing on ground surrounded by a wide trench. The ridge layer of soil is best put on a week or so later in order to permit complete ventilation. Stored in such a manner mangolds will remain in excellent condition throughout the winter, during which time the roots will "ripen."

* A note on the manuring of the mangold crop, which may be read with the present article, was given in the *Journal* for April, 1905.

STUDIES OF WEEDS.—II. COLTSFOOT.*

One of the common weeds about which farmers make frequent enquiry is coltsfoot, or foal's foot (*Tussilago Farfara*, L.), as it is sometimes called. The flowers of the plant are among the earliest to bloom in spring, being generally seen in February and March.

The flower heads come up singly or three or four together from an underground rootstock; the stalks bearing them usually grow from four to ten inches high, and are clothed with small scale-like leaves (Fig. 1).

At first the flower heads droop, but when they open out they are erect. At night or in dull weather they close up, but expand in bright sunshine. Each head consists of yellow flowers arranged on the same plan as those in a daisy, having a central collection of small florets—the “disk” florets—and an outer rim of “ray” florets. The “disk” florets which occupy the central parts of the flower head are about thirty in number. Each has a small tubular corolla with five regular divisions or segments. Stamens which bear pollen are present, and there is also a thickish, blunt stigma attached to the ovary below. Although stamens and pistil occur together in them, these

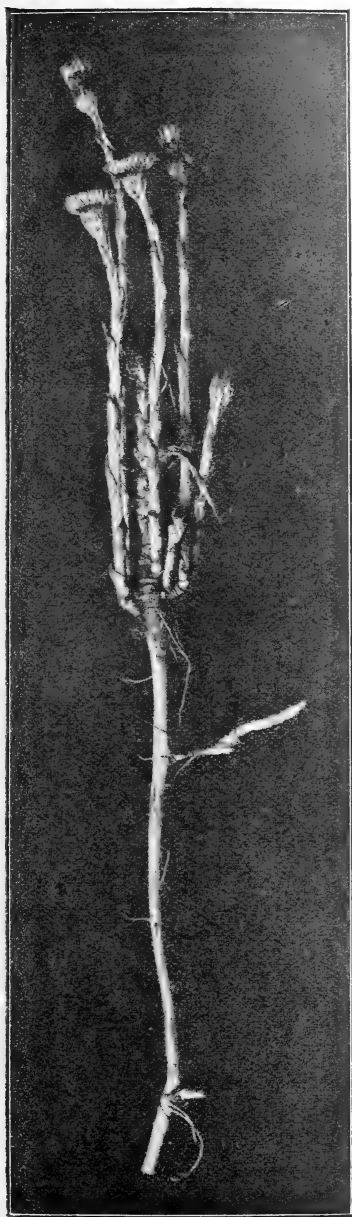


FIG. 1.—COLTSFOOT BEFORE LEAVES APPEAR.

* The first of Prof. Percival's articles on Weeds (Some Common Thistles) appeared in the *Journal* for March, 1906, Vol. XII., No. 12.

flowers rarely, or never, bear fertile seeds. Honey is produced by the flowers, and flies, bees, and other insects pay visits to them for it.

The outermost "ray" florets, of which there are from 200 to 300 in each head, are irregular, with a narrow strap-shaped extension of the corolla. They are female only, having no stamens and therefore no pollen. The stigma, which is divided at the top, projects a short distance from the tube of the corolla. It is protruded, and ready for the reception of the fertilizing pollen before the central florets of the same flower head are open, so that fertilization, if it is effected at all, is brought about by pollen which has been transferred to it by insects from older distinct flower heads.

Cross-fertilization is the rule, and fertile seeds arise in the ovaries of the "ray" florets. Each ripened fruit or "seed" is a thin elongated structure, orange-red in colour, and bears at its apex a bunch of white fluffy hairs or down called the pappus, just as in thistle "seeds." These "seeds" are carried about by the wind, and spread over the land in the neighbourhood of the parent plants. They only germinate readily under shady conditions in loose, damp soil, or on ground covered with herbage, between the leaves of which the seeds ultimately find their way when they settle. In dry situations or on smoothly-pressed soil they germinate very irregularly or not at all.

The seedlings are remarkably small, with two very narrow cotyledons. After a week or two the first broad, somewhat heart-shaped leaf appears (Fig. 3).

The blooming of the first flowers and the sowing of the seeds occur very commonly before the leaves of the plant are sent above ground, a peculiar feature which it is essential to emphasize. After the flowers have been developed some time the leaves begin to appear. They arise from underground buds of the rootstock, distinct from those out of which the flower heads arise (Figs. 1 and 2). The leaves, when fully developed, are generally from four to eight inches across, roundish or heart-shaped, with a few marginal teeth and downy beneath. In shape they bear a fanciful resemblance to the foot of a colt, hence the name of the plant (Fig. 2).

The rootstock branches below the surface of the ground and

extends to very considerable depths. I have several times traced it vertically downwards in stiff clay three or four feet (Fig. 2).

Coltsfoot is commonly confined to stiff, damp soils, and more



FIG. 2.—LEAVES AND RHIZOME OF COLTSFOOT (on the left).
COLTSFOOT PLANT JUST AFTER "SEEDING" (on the right).

especially to those containing lime or marl, although it is sometimes met with where lime is not abundant.

Methods to be Adopted in Getting Rid of Coltsfoot.—I. Very frequently no attempt is made to get rid of this pest until its

conspicuous broad leaves become an eyesore to the farmer. It is, however, essential to check seeding, and the plant should be spudded or hoed out while in flower. This prevents the mischief due to the distribution of ripe seed, and if properly done many of the leaf-buds on the rootstock just below the surface of the soil are damaged, weakened, or destroyed at the same time.

2. Repeated spudding or hoeing of the leaves early in the season, and later also, as recommended in Leaflet No. 166 (p. 9), for creeping thistle, must be practised. This is especially necessary where the plant is established on arable fields.

3. Wherever possible the ground should be dried by well-



FIG. 3.—COLTSFOOT SEEDLINGS. SIX DAYS—THREE WEEKS OLD (Natural size).

placed drains. The plant does not succeed except where the soil is stiff and retentive of moisture.

4. Coltsfoot grows best, and is specially adapted to thrive, in situations where the leaves have free, unrestricted exposure to sunlight. Hence it succeeds on poor soils where other plants are checked, the absence of competition favouring its access to light. On arable land kept free from weeds it luxuriates especially. In pastures and meadows it can be gradually destroyed by the application of manures of a nitrogenous character—farmyard manure, nitrate of soda, and similar materials—which encourage grass and other tall-growing herbage.

5. Deep ploughing in the hotter periods of summer does much to destroy it.

JOHN PERCIVAL.

This fungus is one of the commonest diseases of the potato. It attacks stored potatoes, and is always present to some extent, but as a rule only reaches the proportions of an epidemic during hot, dry seasons, which favour the rapid development and spread of the fungus.

**Winter-Rot of
Potatoes.**
(*Nectria solani*, Pers.)

The tubers only are attacked, and inoculation, through spores present in the soil, takes place when the tubers are young; but, as a rule, there is no obvious disease present when the tubers are lifted, although the mycelium of the fungus is present in the tissues. The further extension of the disease depends entirely on circumstances. If the potatoes are kept dry and exposed to



WINTER ROT (*Nectria solani*).

the air no further development takes place. On the other hand, if they be stored or placed in heaps so that air is practically excluded, and more especially if stored before being perfectly dry, sweating takes place, the temperature is raised, and within a few weeks the mycelium present in the tubers commences growth. The first external indication of disease is the gradual depression and shrivelling of a portion of the surface of the tuber; these sunken portions are soon more or less covered with white patches of the fungus, bearing myriads of spores, which are quickly distributed by mites and other minute creatures. At a later stage the white tufts change to a pale pink colour, and produce a second crop of spores, which in like manner are distributed through the heap of potatoes by mites, &c. By

these means the disease quickly spreads, and, aided by bacteria, the tubers are soon reduced to a soft, foetid mass, the skins alone remaining intact. During the following season the most perfect stage of the fungus, in the form of minute crimson-red points, develops on the skin of diseased tubers. The spores of this stage germinate in the soil and infect future crops.

The best preventive against winter-rot is to make certain that the potatoes are well dried before storing, during which process they should be sprinkled with powdered sulphur, which not only destroys the fungus but also holds in check mites, woodlice, &c., which, by their movements, convey the spores from one potato to another. "Pits" or "clamps" should be well ventilated.

Land that has produced a diseased crop will certainly be infected, and potatoes should not be planted again for some years. Lime, or preferably kainit, should be applied to infected land.

The figure shows diseased tubers bearing white tufts of the fungus, the condition most usually seen.

The Royal Commission on Tuberculosis (Human and Bovine) appointed in August, 1901, have now issued a Second Interim

**Human
and Animal
Tuberculosis.**

Report* containing a detailed account of the results which were briefly stated in the First Interim Report, and of the progress which has since been made in the inquiry.

The Commission were directed to inquire and report with respect to tuberculosis :—(1) Whether the disease in animals and man is one and the same ; (2) whether animals and man can be reciprocally infected with it ; (3) under what conditions, if at all, the transmission of the disease from animals to man takes place, and what are the circumstances favourable or unfavourable to such transmission.

As it was desired that the inquiry should be essentially an experimental one, the Commission decided, in the first instance, not to examine witnesses, but to institute the fullest possible experimental research in laboratories under its own direct control. It was decided to carry out two independent investigations, one with tuberculosis occurring in bovine animals, and the other

* Cd. 3322. Price 9½d. [The first Interim Report (Cd. 2092. Price 1d.) was summarized in this *Journal*, June, 1904. p. 161.]

with tuberculosis of human origin, the two investigations being kept strictly separate, being conducted at places situated as far as conveniently possible from each other, and each being under the care of a qualified resident investigator.

For this purpose the Commission accepted the very generous offer made by Sir James Blyth, who placed at their disposal two farms on the borders of Hertfordshire, about $1\frac{1}{2}$ miles apart, comprising in both cases complete sets of farm-buildings, which had not been used for cattle, and as much land as the Commission desired to use. In addition to these two farms, Sir James Blyth provided a house for the members and their assistants, where a third laboratory was subsequently established.

The present Report deals with the experiments and investigations as to the effect of introducing the germs of human and bovine tuberculosis into the bodies of bovine and other animals, and the results already arrived at are summed up as follows :—

There can be no doubt but that in a certain number of cases the tuberculosis occurring in the human subject, especially in children, is the direct result of the introduction into the human body of the bacillus of bovine tuberculosis ; and there also can be no doubt that in the majority at least of these cases the bacillus is introduced through cows' milk. Cows' milk containing bovine tubercle bacilli is clearly a cause of tuberculosis and of fatal tuberculosis in man.

Of the sixty cases of human tuberculosis investigated by the Commission, fourteen of the viruses belonged to Group I., that is to say, contained the bovine bacillus. If, instead of taking all these sixty cases, attention is confined to cases of tuberculosis in which the bacilli were apparently introduced into the body by way of the alimentary canal, the proportion of Group I. becomes very much larger. Of the total sixty cases investigated twenty-eight possessed clinical histories indicating that in them the bacillus was introduced through the alimentary canal. Of these thirteen belong to Group I. Of the nine cases in which cervical glands were studied, three belong to Group I., and of the nineteen cases in which the lesions of abdominal tuberculosis were studied, ten belong to Group I.

These facts indicate that a very large proportion of tuberculosis contracted by ingestion is due to tubercle bacilli of bovine source.

A very considerable amount of disease and loss of life, especially among the young, must be attributed to the consumption of cows' milk containing tubercle bacilli. The presence of tubercle bacilli in cows' milk can be detected, though with some difficulty, if the proper means be adopted, and such milk ought never to be used as food. There is far less difficulty in recognizing clinically that a cow is distinctly suffering from tuberculosis, in which case she may be yielding tuberculous milk. The milk coming from such a cow ought not to form part of human food, and, indeed, ought not to be used as food at all.

These results clearly point to the necessity of measures more stringent than those at present enforced being taken to prevent the sale or consumption of such milk.

The Report also contains (1) an "Introduction," giving an account of the experimental stations, the animals experimented upon, the material used, and generally of the procedure adopted in the inquiry; (2) a brief historical sketch of the disease of tuberculosis; and (3) a memorandum on the results of the experiments up to November, 1906.

Isle of Man.—The Lieutenant-Governor of the Isle of Man, under the powers conferred by the Cattle Diseases Prevention Acts, has made an order, dated 29th January, 1907, providing that any person desiring to import sheep into the Isle of Man from the United Kingdom is to apply for permission to John Q. Cannell, C.P., of Ballacarnane, Michael, Isle of Man, the duly appointed Inspector of Scab, at least seven days before the date of importation. The application is to be accompanied by an affidavit, duly sworn before a Justice of the Peace, from the person desiring to import the sheep, to the effect that they are free from scab. On receipt of such affidavit, it shall be lawful for the Inspector to sanction their importation. No sheep are to be imported without such permission by the Inspector in writing.

**Live Stock Import
Regulations.**

The person importing the sheep is to give at least twenty-four hours' notice, in writing, to the Chief Constable, and to the Inspector, of the port at which he proposes to land such sheep, and of the boat by which he proposes to import them.

Ireland.—The Department of Agriculture and Technical Instruction for Ireland have made a new Order—the "Importation of Horses, Asses, and Mules (Ireland) Order of 1907"—by which the similar Order of 1906* is revoked. The regulations in the new Order came into operation on February 21st, 1907, and from that date inclusive supersede those hitherto in force respecting the importation into Ireland of horses, asses, and mules from Great Britain, the Isle of Man, and the Channel Islands.

As a result of this change, animals of these classes, which could previously be imported on the production of a veterinary certificate, and a declaration from their owner that the animals had not been exposed to infection, are from February 21st, 1907, required to be accompanied by a permit from the Department before their importation can be effected; and the importation is subject in each instance to such conditions as may be prescribed in the permit.

Persons seeking permits should make timely application in the matter to the Department of Agriculture and Technical Instruction, Upper Merrion Street, Dublin, so that a sufficient interval may be allowed in all cases for any inquiries that may be considered necessary.

Three new Sheep-Dipping Orders have been made by the Board of Agriculture and Fisheries under the Diseases of Animals Acts, 1894 to 1903, the Orders being (1) The Sheep-Dipping (England) Order of 1907, (2) The Sheep-Dipping (Scotland and North of England) Order of 1907, and (3) The Sheep-Dipping (Wales and Monmouth) Order of 1907. All three Orders are dated Feb. 18th, 1907.

The dipping area included in the first of these Orders comprises the whole of England except the county of Monmouth, which is included in a dipping area with Wales, and

* *Journal*, July, 1906, p. 240.

certain northern counties which are included with Scotland in a separate dipping area (Art. 1). Provision is made for an annual dipping of all sheep in the dipping area during the prescribed dipping period, which commences on the 15th May and terminates on the 31st August (Arts. 2 and 5). Certain exemptions are authorised subject to such conditions as the Local Authority may impose as to subsequent dipping (Art. 4). Notice of intention to dip is required in order that the Local Authority may be represented at the dipping if they so desire. If the dipping is unavoidably postponed no further notice is required provided that the sheep are dipped as soon as possible. If the Local Authority is not represented at the dipping a return of the dipping must be sent to their representative in the Form B. (Art. 5). Sheep may be moved into the dipping area without being dipped previously, and dipping is not required prior to exposure in markets, but during the prescribed dipping period sheep so exposed, and also all sheep moved into the dipping area directly or through a market, must on arrival at the farm to which they are moved, be dipped on or before the 31st August, and until such dipping must be isolated from sheep on the premises already dipped [Art. 6 (1)].

The arrival of sheep at premises in the dipping area during the prescribed dipping period must be notified by the occupier within ten days [Art. 6 (3)], and provision is made for notification to the Local Authority of the fact that the sheep have been dipped or slaughtered. A Local Authority may authorise premises for temporary detention of sheep, and the premises will then be treated as if they were a market, so as to involve subsequent dipping and isolation of the sheep which pass through the authorised premises [Art. 6 (5)].

After the expiration of the prescribed dipping period, returns are required to satisfy the Local Authority that all sheep in the dipping area, except those specially exempted, have been dipped in accordance with the Order (Art. 9). Only sheep-dips approved by the Board may be used for the prescribed dipping (Art. 3). Clipping before dipping is required except in the case of lambs under nine months old (Art. 7). Isolation of dipped sheep from undipped sheep is required (Art. 8), but this does not prevent dipped sheep from being sent to a market,

subject to the provision (Art. 6) of the Order which requires dipping and isolation after exposure in markets.

(2) As regards the Sheep-Dipping (Scotland and North of England) Order of 1907, three Orders of 1906 are by it revoked, these being the Sheep-Dipping (Scotland) Order of 1906, the Sheep-Dipping (Scotland) Order of 1906 (No. 2), and the Sheep-Dipping (North of England) Order of 1906. In the new Order the Board have given effect to various representations made to them with the object of removing certain difficulties which have been experienced under the Order of last year. The principal modifications are as follows :—

Provision has been made [Art. 3 (2)] for an extension of the time of dipping sheep moved into the area at the end of the period. The return of dipping is to be rendered only when the Local Authority are not represented at the dipping [Art. 4 (3)]. Some elasticity is now allowed in the conditions imposed, which will permit of movement by licence of the Local Authority for slaughter, dipping, or other necessary purpose. All restrictions on movement out of the area before the 1st September are dispensed with in view of the dipping orders in operation elsewhere in Great Britain (Art. 15). A new clause has been inserted [Art. 15 (2)] by which the movement of sheep through markets may in many instances be facilitated. Provision has been made for simplifying the procedure as regards declarations in the case of sheep introduced from other parts of Great Britain or from Ireland after the termination of the dipping period in force in those parts.

The dippings of sheep which have taken place since the 1st January in accordance with the Order of 1906 will satisfy the requirements of the new Order for the first dipping period of the current year.

(3) The Sheep-Dipping (Wales and Monmouth) Order of 1907 will apply to the whole of Wales (with the exception of the county of Carnarvon, where the Sheep Scab [Compulsory Dipping Areas] Order of 1906 remains in force) and to the county of Monmouth, and it provides for the annual dipping of all sheep within that area.

As few changes as possible have been made in the arrangements prescribed by the Sheep-Dipping (Wales) Order of 1906,

which is now well understood in the district to which that Order applied, and the new Order therefore follows as closely as possible the Order of 1906. The period of restrictions on movement and markets [Art. 15 (1)] is limited to the dipping period which terminates on the 15th September [Art. 15 (1)]. Another provision will facilitate the admission of sheep from Ireland after the expiration of the dipping period in that country.

During the past two or three months the Board have been consulted as to a disease of young sheep, occurring in the autumn in the North of England, especially on the Yorkshire moors, among black-faced mountain sheep.

**"Double Scope"
in Sheep.**

It was said that the affected animals lost condition, becoming thin and poor, and that their heads were found to be hollow or to present an abnormal appearance. In order to remedy this state of affairs and cure the sheep, certain shepherds have been in the habit of "cracking the skulls" of the affected animals. After such treatment, it was stated, the sheep usually recovered.

With regard to this alleged disease, the Veterinary Officers of the Board have made inquiries which go to show that the statements are founded on ignorance of anatomical conditions. "Double scope" appears to be the invention of certain shepherds who have, when making *post-mortems*, noticed that a cavity (the frontal sinus) exists with an inside and an outside plate of bone. This is a normal condition, but it is probable that the said shepherds have believed it to be abnormal, since they have only made *post-mortems* on sheep which have died of some disease, and have not inquired whether the said anatomical condition is present in normal sheep. It is found that some of these shepherds consider that several diseases which are undoubtedly due to parasites in the intestines, and other causes, are referable to this supposed abnormality which they term double scope, and further, that they are in the habit of "cracking the skull" as a remedy.

One of the recommendations made by the Departmental Committee on the Fruit Industry was that the telephone should be further extended to country districts.

Telephones in Rural Districts.

With a view to giving effect to this recommendation the Board of Agriculture and Fisheries brought the matter before the Postmaster General, and also communicated with the principal Fruit and Horticultural Associations and Societies in order to ascertain particular places where the introduction of a telephonic service would be attended with special advantages to fruit-growers. In consequence of the information which was placed before the Postmaster General by the Board, certain facilities were introduced into the Budget enabling the guarantee required in the case of certain telephone extensions to be reduced. The basis of the guarantee now required is explained in a previous number of this *Journal* (July, 1906, p. 227).

As a result of the enquiries addressed by the Board to Horticultural Associations, a number of applications for extensions of the telephone system in rural districts were received and submitted to the Postmaster General, who has supplied the Board with a statement of the steps which have been taken to meet the wishes of fruit-growers in this respect.

It should be noted, however, that the requirements of some vegetable and fruit-growing districts had been already dealt with by the Post Office in earlier years. Among these may be mentioned :—Dartford, Swanley Junction, Farningham, Crockenhill, Hextable ; Westerham, Brasted ; Cranbrook, Hawkhurst, Tenterden ; Uckfield ; Horsham, East Grinstead, Hayward's Heath, Cuckfield, Crawley, Cranleigh ; Broadway (Worcs.) ; Winchcombe ; Ross (Hereford) ; Ely ; Sleaford ; Bourne, Market Deeping ; Holbeach, Spalding ; Hitchin, Baldock, Royston, Letchworth, Knebworth Station ; Tring ; Biggleswade, Sandy, Potton ; Loddon, Brooke ; Thetford ; Sudbury ; Witham, Wickham Bishops ; Farndon (Cheshire).

In many cases, however, the expense of installation involved is greater than the probable business would justify, and the Postmaster General is not able to undertake the work without a guarantee. The State now bears two-thirds of any deficit under a guarantee, and the guarantors the remaining third

only. Advantage has been taken of these revised guarantee terms in the following instances:—Chewton Mendip; Cottenham, near Cambridge; Ombersley, Worcestershire; Linton, near Maidstone; Alderton, near Winchcombe (Glos.); Bromyard, Herefordshire; Trumpet, near Ledbury; Littleport and Stretham, near Ely. In these cases a call office has either been opened or is likely to be provided shortly. There are also some other cases under consideration.

Exchanges have been opened at Edenbridge, Kent, and at Ledbury and Wymondham, Norfolk, without guarantee, and exchanges are being installed at Long Sutton and Sutton Bridge, near Wisbech, and at Lindfield, Sussex. A Post Office call office has been opened at Rogerstone, Newport, Mon., and the National Telephone Company has provided a call office at St. Anne's Park, Bristol. The company also proposes to provide a service at Somersham, Earith, Colne, and Bluntisham in Huntingdonshire, and in the neighbourhood of Helston, Cornwall.

In the Blairgowrie district in Scotland, the Post Office has opened call offices at Murthly and Caputh, and hopes to be able shortly to meet the requirements of the fruit-growers at Essendy, which lies between Blairgowrie and Caputh. The question of providing a service at Alyth and Meigle in the same district is also under consideration, and enquiries are being made as to the prospect of adequate support for an exchange at Biggar.

In the North of Ireland large extensions of the telephone system have been carried out during the past year. Dungan, Cookstown, and Omagh now have a service, and extensions to Armagh and Enniskillen will be completed shortly. It has not yet been possible to serve the fruit-growing districts of Duleek, Anaghmore, and Richill, but an attempt will be made to obtain guarantees. In the South of Ireland the trunk system has been extended to Clonmel, Cahir, and Killarney.

Other extensions of the Post Office telephone system, which may be of use to fruit-growers and agriculturists generally, have been made during the year to Wells, Shepton Mallet, Glastonbury, Street; Stevenage, Herts.; Bungay, Norfolk; Harleston, Norfolk; Diss, Suffolk; Eye, Suffolk; Halesworth, Suffolk; Aylsham, Norfolk; Haverhill, Suffolk; Dunmow,

Essex ; Whitchurch, Bucks. ; Stony Stratford, Bucks. ; Wolverton ; and exchanges are in course of construction at the following places :—Haslemere, Winslow, Buckingham, Newport Pagnell, Olney, Malmesbury, Tetbury, Newbridge-on-Wye, Milford Haven, Pembroke, Tenby, Narberth, Saxilby (Lincs.).

It should be mentioned that many of the fruit-growing villages in Kent are in areas assigned to the National Telephone Company for the development of their system, and persons interested in extensions to these places should apply in the first instance to the Company.

The extensions named above will be available for communication with all places in the kingdom connected with the trunk system ; but, apart from these, several schemes have been carried out during the year which provide for local communication only between groups of villages and their market town. These include :—

(i.) A system giving communication between Malton (Yorks.) and the villages of Amotherby, Ampleforth, Birdsall, Burythorpe, Gilling East, Oswaldkirk, Rillington, Settrington, Terrington, West Heslerton, and Wintringham.

(ii.) A system for communication between Selkirk and other towns on the National Telephone Company's system in the Galashiels area and the villages of Ettrick Bridge, Ettrick, Yarrowford, Yarrow, and Coppercleuch.

(iii.) A system for communication between Oakham, Melton Mowbray, and the villages of Colston Bassett, Harby, Hickling, Long Clawson, Strathern and Waltham Ashwell, Braunston, Burley, Cold Overton, Cottesmore, Exton, Streetham, Hambleton, Manton, Market Overton, Thorpe Satchville, Whissendine, Wing, Wymondham.

(iv.) A system for communication between Bourne, Market Deeping, and the villages of Edenham, Grimsthorpe, and Witham-on-the-Hill.

A system is also being installed for local communication between Easingwold and the villages of Alne, Brandsby Crayke, Hushwaite, and Stillington.

It has been a frequent complaint of late years that the old skilled race of agricultural labourers is fast disappearing from the country, and that there are no young men coming on to take their place. This has not been due to any lack, on the part of farmers, of encouragement to the men in their employ to become specially skilled workmen. Agricultural societies and similar bodies have held competitions for farm hands in the various manual processes of agriculture, and such competitions have called forth a keen spirit of emulation amongst those who have taken part in them, and have assisted what is probably the truest form of education, that of enabling a person to educate himself by observing the practice and the skill or proficiency of others. Still, there was no doubt that if the old-fashioned pride and skill in manual work was to be revived, something more was needed. This was largely supplied at the passing of the Customs and Excise Act of 1890, which enabled the matter to be carried a step further, by placing it within the power of County Councils to make provision for definite instruction in these various subjects, and thus trying to arouse fresh interest in them.

Several County Councils from the outset availed themselves of the opportunities thus offered, and organized instruction in ploughing, thatching, hedging and ditching, and other kindred processes. Other counties have from time to time followed their example, and it is not easy to over-estimate the value of the work thus done. It tends not only to benefit the labourer directly by increasing his efficiency, but indirectly by giving him a real interest in his daily avocations, thus rendering him less inclined to exchange the benefits of the country for the supposed advantages of town life. The work, too, has not been confined to labourers, and it has been a most encouraging sign of the times to find young farmers constantly taking advantage of the instruction offered, thereby setting the best possible example to the men in their employ. There is good reason to hope therefore that, at any rate in those counties which have made provision for this class of instruction, there will not in the future be the same ground of complaint that has existed in the past as to the lack of young or middle-aged skilled labourers.

**The Manual
Processes
of Agriculture.**

In order to assist County Councils in making provision for this class of instruction, the Board have obtained information as to the facilities already available. This information is published in the Report on the Distribution of Grants for Agricultural Education (*Cd.* 3,317, price 10d.), and supplies particulars as to the courses of instruction, number of pupils, competitions, &c.

It appears that instruction in manual processes is given in fifteen counties, the subjects comprising ploughing, drilling, grass mowing, setting out roots, harvesting, setting up sheaves, stacking, thatching (including rope and spar making), hurdle making, basket making, sheep shearing, milking, hedging and ditching, land draining, pruning, grafting, budding, hop drying, and fruit packing. The most general subject, however, is hedging and ditching, which is taken up in almost all the counties, while ploughing and thatching are taught in more than half of those counties which have made returns.

Two counties have mentioned shepherding as having engaged attention. This can hardly be classed as a manual process, but mention may be made of the way in which instruction is provided in Dorset by means of a yearly examination of shepherds and their pupils. Owners who wish so to do enter their flocks for the sake of their shepherds, who are, during the season, examined in a very thorough and practical manner. The examiner for the year is a local farmer who is associated in this work with the county staff instructor in agriculture. The two visit each flock two or three times during the season, carefully examine its condition, take note of the percentage of lambs reared, put searching, but informal, questions to the shepherd as to his management of the flock in health and in disease, and finally examine his pupil. According to the answers of this last, not only are marks awarded to him for the competition in which he takes part, but reward is accorded to the shepherd who has him under training. This work has now been in progress for several years, and the good results accruing from it are becoming increasingly apparent, especially in getting the men to manage their flocks in an intelligent and open manner.

The Board of Agriculture and Fisheries have addressed the following circular letter, dated 14th February, 1907, to County Councils in Great Britain:—

**Circular Letter to
Local Authorities
under the Small
Holdings Act,
1892.**

SIR,—I am directed by the Board of Agriculture and Fisheries to ask you to call the attention of your Council to the Report of the Departmental Committee on Small Holdings (*Cd.* 3277), and in particular to the observations contained therein with respect to the present administration of the Small Holdings Act, 1892.

The Committee made certain recommendations for the amendment of the Act with the object of giving further powers and wider discretion to County Councils for the provision of Small Holdings. These and other proposals for legislation are under the consideration of the Board, but in the meantime I am to invite the attention of your Council to the suggestions and recommendations made by the Committee to which effect might be given under the law as it stands.

It would appear from the Report of the Committee (paragraph 23) that Section 5 of the Act has been read as providing that the Small Holdings Committee of a County Council are not required to take any action until they receive a petition alleging that there is a demand for small holdings in a particular division of the county, and that the petition must refer to specific lands. The Committee point out that it is the duty of every Small Holdings Committee of a County Council to consider whether the circumstances of the county justify the Council in putting into operation Part I. of the Act, and they suggest that in order to satisfy the requirements of the law in this respect the Committee should on their own initiative make such enquiries as may be necessary to enable them to report to the Council. The Committee further point out that petitions received under Section 5 (2) may be general and need not refer to specific lands, and that the enquiry ordered under the same section need not be a public or local one. In these circumstances the Committee recommend that an annual enquiry be made by the Small Holdings Committee of a County Council from the minor authorities within the county, as to the land occupied by small holders, and as to whether

there is a demand for further land, and whether any land is available for the purpose.

The Committee also recommend that the Board should make a return annually to Parliament showing the progress made in the provision of small holdings by local authorities, the extent of the difficulties, or the measure of success experienced.

In the return (*H.L.* 192) presented by the Board to Parliament in 1903, information was given as to the extent to which the Act had been put in operation by County Councils up to 31st December, 1902. The Board think it desirable that this information should be brought up to date, and they would be obliged if you would be good enough to state whether any proceedings under the Act have been taken by your Council since the date above named, and, if so, if you would furnish them with full particulars at your early convenience.

I am at the same time to suggest that the Small Holdings Committee of your Council might with advantage proceed forthwith to make such an enquiry from minor authorities as is recommended by the Departmental Committee.

I am, Sir,

Your obedient Servant,

T. H. ELLIOTT,

Secretary.

On certain large, well-managed estates the cottages are kept in hand by the landlord who can afford to pay an agent or clerk to collect the rents from the occupiers **Tied Cottages.*** direct. But farmers as a rule prefer to have cottages with the farm, which they sublet to their hands so as to have more control over them. Tied cottages are either let at a lower rent than the market value, the relatively low wage of the labourer being made up by a payment in kind, namely, a cheaper cottage; or the labourer occupies it free and receives a correspondingly lower wage.

The weight of the evidence given before the Committee

* Special Report of the Select Committee on the Housing of the Working Classes Acts Amendment Bill (*H.C.* 376, price 4s. 9d.).

on Rural Housing showed that farm servants prefer to rent their cottages direct from the owner and not from the farmer, because it gives them a sense of greater independence and security in their daily relations with their employer, and, further, places them in a more independent position if they desire to approach their landlord on the question of rent or repairs. In many districts in the South of England the wages of agricultural labourers still remain low, but it has been shown that in many of these cases the wages are supplemented by various payments in kind which would represent in money an amount of wage higher than that actually paid. Naturally, where the tied system prevails, the cottager is reluctant to complain to his employer, because he imagines that he has the cottage rent free and fears to lose these payments in kind. The condition of the labourer's cottage when attached to the farm may easily be overlooked, the farmer's requisitions upon the landlord being confined to the improvement of the farm, and applications for the necessary repairs to the cottages deferred from year to year. Many tied cottages are accordingly neglected and get into a bad state of repair. On broad principles it is desirable that every labourer should receive his full wages in cash and not in kind, on the analogy of the Truck Acts; and that the cheap cottage, and the contributions in kind to the labourer, should be relinquished. The farmer's objection to the abolition of the tied cottage is a natural one, because a farm must have attached to it a certain number of cottages to house those farm servants who are necessary for the regular conduct of the farm. The tied cottage is therefore an integral part of the equipment of a farm. Without a sufficiency of cottages to guarantee the necessary number of residential farm servants of the more indispensable kind, a farm, otherwise desirable in every way, will not command a full rent. The difference in the rent will be disproportionate to the intrinsic capital value of the cottages. Consequently, the provision of cottages, although showing a loss on the intrinsic capital outlay upon their erection, would indirectly enhance the value of a farm. The rent-bearing capacity of the whole farm is influenced by the presence in being and on the spot of a good class of labourer; and this superior type of man, possessed of

some elementary education and more modern ideas of seemliness in living, is only to be persuaded to a country life by a decent, habitable, and healthy cottage, with sufficient land attached. The Committee are of opinion that the supply of labour would tend to increase if cottages were detached from the farm lease and made free, as it would make the men less dependent on the farmer and give greater security of tenure. If higher rents were charged for cottages, the labourers in their turn would receive correspondingly higher wages, and the landlord would receive proportionately less for the farm, but would be receiving the rents for the cottages direct. It would, therefore, be to the ultimate benefit of all concerned if the tied cottage system were done away with as soon as practicable, and the change is, in fact, being made on many estates with mutual satisfaction without any of the objections that have been advanced being realized. It would be quite easy in the case of a cottage so situated as to be a necessary part of the equipment of a farm to provide in the lease that employment on the farm should be a part of the conditions of occupancy.

The Aspatria Agricultural Co-operative Society was established thirty-five years ago for the co-operative purchase of fertilisers, feeding stuffs, seeds, and other requirements for farmers in the neighbourhood, not only with the view of obtaining them at a reasonable price, but also to secure a reliable article. All the cakes, manures, &c., purchased are analysed on behalf of the Society and supplied under guarantee. The share capital is subscribed, and hitherto interest has been paid on this at the rate of 5 per cent. In consequence, however, of much of the capital being contributed by non-purchasing members, the interest to members whose purchases do not amount to £10 per annum has been reduced to $3\frac{1}{2}$ per cent., members buying more than that value still receiving 5 per cent. A dividend of 3d. in the £ on the amount of the purchases was also paid last year.

An interesting example of the advantages of a careful examination of the feeding stuffs supplied occurred recently in

the case of a special cake which had been sold by the Society for some twenty years. This cake was made for the Society under a guaranteed analysis from linseed and other materials of a high feeding value. A lot delivered last year proved on analysis to comply chemically with the guarantee, but when examined microscopically showed an admixture of other seeds, with the result that an allowance of 15s. a ton was obtained from the contractor.

It is claimed that apart from the advantages obtained by members, the farming community in general has benefited by the influence of the Society, owing to the fact that private dealers competing with it have been compelled to regulate their prices to the Society's standard.

In a circular addressed to Local Authorities in England and Wales, dated 24th January, 1907, the Board of Agriculture and Fisheries call attention to the Open Spaces **Open Spaces Act, 1906.** Act, 1906, which came into operation on the 1st January last, and consolidates the previous enactments relating to open spaces. The statutes dealing with the subject were in a confused condition, and the difficulty of interpreting and applying them had been increased by the changes made since the passing of the Metropolitan Open Spaces Act, 1877, in the local authorities affected by them. The Board entertain the hope that the present Act, by setting out the powers of the local authorities to whom the Act applies in a clear and intelligible form, may facilitate and encourage the acquisition and preservation of open spaces for the use of the community.

The open spaces (as defined in Sec. 20) to which the Act applies are:—

1. Gardens or open spaces placed under the care and management of trustees or other persons by a local or private Act (Sec. 2).

2. Open spaces held by trustees (not being trustees under a local or private Act) for the purposes of public recreation (Sec. 3).

3. Open spaces vested in trustees for charitable purposes (Sec. 4).

4. Open spaces belonging to private owners subject to rights of user for exercise and recreation in the owners or occupiers of houses round or near the same (Sec. 5).

5. Disused burial grounds (Sec. 6).

In these several cases the trustees or owners have certain powers, subject to specified conditions, of transferring the open space or its care and management to a local authority for the use of the public. The nature of the powers varies in the several cases, and in each case the particular provisions should be referred to.

The Act also enables corporations (other than municipal corporations) and other persons to sell or give lands to a local authority to be preserved as open spaces for the enjoyment of the public (Sec. 7).

The following are local authorities for the purposes of the Act (Sec. 1):—

1. The council of any county or of any municipal or metropolitan borough or of any district.

2. The common council of the City of London.

3. Any parish council invested with the powers of the Act by an order of the County Council.

The Act empowers a local authority to:—

1. Acquire, by agreement for valuable consideration or by way of gift, the freehold of, or any term of years or limited estate or interest in, or any right or easement in or over, any open space or burial ground, whether situate within its district or not (Sec. 9).

2. Undertake the entire or partial care, management and control of any such open space or burial ground (Sec. 9).

3. Hold and administer any such open space or burial ground for the enjoyment of the public as an open space (Sec. 10).

4. Maintain and keep the open space or burial ground in a good and decent state (Sec. 10).

5. Make bye-laws for the regulation of such open spaces or burial grounds and for the preservation of order and the prevention of nuisances (Sec. 15).

6. Exercise, in respect of open spaces or burial grounds vested in the local authority otherwise than under the Act, all the powers conferred by the Act (Sec. 12).

A County Council is empowered to acquire, lay out and maintain any lands to be used as public walks or pleasure grounds, and may support or help to support public walks or pleasure grounds provided by any person (Sec. 14).

Two or more local authorities may jointly carry out the provisions of the Act (Sec. 16).

The Board of Agriculture and Fisheries have received from the Foreign Office a memorandum by Mr. S. P. Cockerell, Commercial Attaché, on the prospects for
Agricultural Show at Madrid.— British exhibitors at the Madrid Cattle Show, which is to be held from May 22nd
Prospects of Exhibitors. to 26th next.

There is at present very little importation of live stock from Great Britain into Spain, the principal items in 1904 being 29 horses and 102 sheep. Mr. Cockerell thinks that pigs and sheep, especially the latter, might with advantage be shewn by English exhibitors, as on account of the great droughts up to last year many large flocks were decimated or sold to persons who were fortunate enough to have pasturage. This will necessitate the replacing of flocks by those who had to sell. One English firm (whose name can be ascertained on application) has a representative in Madrid, and intending exhibitors might communicate with them on the subject.

It would no doubt be much appreciated if some good English horses could be exhibited, and there would be a fair opportunity of selling the exhibits to the wealthy landowners who are likely to visit the show. Exhibits will certainly be granted temporary admission duty free, and also facilities on railways.

In addition to live stock there are classes for all kinds of machinery:—

1. Reaping machinery. The business in combined binders and reapers is largely in the hands of the American makers, but there are two Canadian and one English machine in the

market. The American prices do not differ greatly from those of their competitors, but they give far easier terms of payment.

2. Threshing machines. This business is almost entirely in English hands. A few American machines have made their appearance, and a French firm have recently sold a machine in the North of Spain.

3. Forks, rakes, and instruments for collecting and loading grass.

4. Straw and hay presses. Hand presses are made by a firm at Barcelona, who manufacture all kinds of agricultural machinery.

5. Models, plans, or reports dealing with the preservation of forage.

6. Straw and root-cutting machines.

7. Machines and apparatus for crushing grain and seed.

8. Horse gear and motors for pumps, mills, &c. Horse gear is largely used throughout the country, and there are a number of native makers. Owing to the large amount of water power, electricity is being increasingly introduced for driving irrigation pumps; this is a direction in which great extension is possible, and one in which English manufacturers might well interest themselves. In the Valencia district, where irrigation is practised on a large scale, steam pumps are largely used, either of local make or from Barcelona.

9. Weighing machines for weighing animals. In regard to these, Mr. Cockerell observes that English makers appear unable to compete with Spanish ones.

10. Dynamometers applicable to traction.

11. Scissors and shearing machines. Attempts have been made to introduce shearing machines, but a primitive pair of scissors locally made is preferred.

12. Apparatus and processes for cleaning and improving wool before shearing. As there are $13\frac{1}{2}$ million sheep in Spain, there should be a demand in this direction.

13. Models, plans, and drawings of wool washers.

14. Apparatus for cooling, sterilizing, &c., milk.

15. Apparatus for butter-making. Some of the leading butter-makers have modern machinery.

16. Apparatus for making cheese.

17. Models and plans of stables, stalls, sheepfolds, &c.

18. Enclosures and cattle sheds.

The programme of the Exhibition, together with forms of application, can be seen at the offices of the Board. All entries must be made before the 30th April.

**Importation of
Potatoes
into Crete.**

The Government of Crete recently made an order directing that all potatoes imported into Crete from Europe should be subject to disinfection in order to prevent the introduction of phylloxera into the island. At the suggestion of the Board of Agriculture and Fisheries, the Foreign Office instructed the Consul-General to represent to the Cretan authorities that inasmuch as phylloxera does not exist in the United Kingdom, there was no necessity for the application of these regulations in the case of potatoes or other agricultural produce brought from Great Britain. The Board are now informed that in consequence of these representations, orders will be given for the admission of potatoes exported from Great Britain without their being subjected to any process of disinfection on condition that each consignment is accompanied by a declaration from the local authorities of the place of origin of the non-existence of phylloxera.

Exhibition of Baking Industry at Buda Pesth.—The Austro-Hungarian Ambassador has informed the Board through the

**Miscellaneous
Notes.**

Foreign Office that the National Association of Hungarian Bakers are arranging an International Exhibition of the baking industry on a large scale at Buda Pesth from May 15th to June 30th next, in which the participation of English representatives of the business is invited.

Lectures to Farmers in Canada.—The plan of using special trains from which lectures are given to farmers on suitable subjects has been successfully adopted in Iowa and other American States, and more recently in Canada. The Ministry of Agriculture organized a tour of this description, and some 206 meetings were held in about two months, from three to five meetings being held each day. The average attendance was 140.

ADDITIONS TO THE LIBRARY.

Africa—

Orange River Colony.—Department of Agriculture, Report 1905-6. (35* pp.) Bloemfontein : Argus P. & P. Co., Ltd.

Rhodesia.—General Handbook. (66 pp.) London : British South Africa Company, n.d.

Australia—

Tasmania.—Secretary of Agriculture and Chief Inspector of Stock, Report, 1905-6. (20 pp.) Hobart, 1906.

Belgium—

Poskin, J.—Étude sur les Insectes producteurs de galles en général et sur les Cynipides gallicoles en particulier. (12 pp.) Namur : Lambert de Roisin, 1902.

Poskin, J.—Les Insectes Ravageurs des Grains en Magasin. (26 pp.) Brussels : P. Weissenbruch, 1903.

Marchal, Ém.—Recherches sur la Rouille des Cereales. (40 pp.) Brussels : P. Weissenbruch, 1903.

Marchal, Ém.—Recherches Biologiques sur une Chytridinée Parasite du Lin. (46 pp. + 1 plate.) Brussels : Xavier Havermans, 1901.

Marchal, Ém.—Résumé du Cours de Pathologie Végétale. (30 pp.) Gembloux : Berce-Hettich.

Marchal, Ém.—Rapport sur les Maladies Cryptogamiques. 1^{er} semestre, 1897 (12 pp.), 2^e semestre, 1897 (9 pp.); 1898 (21 pp.); 1899 (15 pp.) Brussels : Xavier Havermans.

Marchal, Ém.—Bulletin du Service Phytopathologique. Rapport sur les observations effectuées en, 1901 (17 pp.); 1902 (14 pp.); 1903 (12 pp.); 1904 (8 pp.) Brussels : P. Weissenbruch. 1905 (7 pp.) Brussels : E. Daem.

Poskin, J.—Bulletin du Service Entomologique. Rapport sur les observations effectuées en, 1902 (19 pp.); 1903 (11 pp.); 1904 (13 pp.) Brussels : P. Weissenbruch. 1905 (43 pp.) Brussels : E. Daem.

Commission Provinciale d'Agriculture du Hainaut.—Rapport sur l'État de l'Agriculture pendant l'année, 1904 (63 pp.); 1905 (52 pp.) Frameries : Dufranc-Friart.

Canada—

Department of Agriculture.—Experimental Farms, Interim Report, December 1st, 1905, to March 31st, 1906. (98 pp.) Ottawa, 1906.

Central Experimental Farm.—Bull. 55. Results obtained in 1906 from Trial Plots of Grain, Fodder Corn, Field Roots, and Potatoes. (35 pp.) Ottawa : Department of Agriculture, 1906.

British Columbia.—Department of Agriculture. Bull. 19 :—Poultry Raising in British Columbia. (40 pp.) Victoria, B.C., 1906.

Germany—

K. Biologische Anstalt für Land- und Forstwirtschaft.—Arbeiten, 5 Band, Heft 6 :—Der Bakterienbrand der Kirschbäume. (293-340 pp.) Untersuchungen über die Krankheiten der Zuckerrübe. (341-360 pp.) Berlin : Paul Parey, 1907.

Verband landwirtschaftliche Versuchs-Stationen.—Die Futtermittel des Handels. (1,191 pp.) Berlin : Paul Parey, 1906.

Deutsche Landwirtschafts-Gesellschaft.—Jahrbuch, Band 21, 1906. (436 + 422 pp.) Berlin : D. Landw. Gesell, 1906.

Hiltner, Dr. L.—Bericht über die Tätigkeit der Kgl. Bayer. Agrikulturbotanischen Anstalt in München, 1904. (80 pp.) Munich : Klöck und Giehrl, 1905.

Great Britain—

Staffordshire and Shropshire County Councils.—Field Experiments in Staffordshire and Shropshire and at the Harper Adams Agricultural College, Joint Report for 1906. (43 pp.) Stafford, 1907.

Bedfordshire County Council.—Report upon the Demonstration Plots, 1906. (18 pp.) Bedford, 1907.

Gloucestershire Education Committee.—Mangold Experiments, Reports, 1906. (8 pp.)

Lancashire County Council.—Experiments on the Liming of Meadow Land, 1905-6. (9 pp.) Preston, 1906.

Channing, Sir F. A.—Small Holdings. A Practical Policy. (20 pp.) The National Press Agency, 1907.

To Colonise England. A Plea for a Policy. By C. F. G. Masterman, M.P., and others. (xxiii. + 211 pp.) London : Unwin, 1907. 3s. 6d. n.

Great Britain—Continued.

- Chorlton, J. D.*—The Rating of Land Values. (177 pp.) Manchester: Sherratt and Hughes. 3s. 6d. n.
- Agricultural Research Association.*—Utilisation of Nitrogen in Air by Plants. No. II. (117 pp.) Aberdeen.
- Somerville, Prof. Wm.*—The Place of Rural Economy in a University Curriculum. (28 pp.) Oxford: Clarendon Press, 1907. 1s. net.
- Bailey, L. H.*—The Pruning-Book. (545 pp.) London: Macmillan & Co., 1906. 6s.
- Memoirs of the Geological Survey.*—The Geology of the Country between Wellington and Chard. (68 pp.) London: Stanford, 1906. 1s. 3d.
- Land Values Taxation, &c. (Scotland) Bill. Report and Special Report. H.C. 379. (810 pp.) London: Wymans, 1906. 7s.
- Armstrong College.*—Composition of Some Foods and Feeding Stuffs and their Manurial Values. (8 pp.) 1907.
- Royal Commission on Vivisection. First Report of the Commissioners and Appendix. [Cd. 3,325 and 3,326.] (4 and 158 pp.) London: Wymans, 1907. 3d. and 1s. 4d. respectively.
- Tropical Disease Research Fund. Report of the Advisory Committee. [Cd. 3,306.] (56 pp.) London: Wymans, 1907. 5½d.

India—

- Bombay Presidency.*—Department of Agriculture, Report, 1905-6. (36 pp.) Civil Veterinary Department, Report, 1905-6. (42 pp.) Bombay: Government Central Press, 1906. 8d. each.
- Madras Presidency.*—Department of Agriculture, Report, 1905-6. (65 pp.) Madras: Government Press, 1906. 8d.
- Bengal.*—Civil Veterinary Department and Veterinary College, Report, 1905-6. (34 pp.) Calcutta: Bengal Secretariat Book Depot, 1906. 9d.
- Central Provinces and Berar.*—Agricultural Stations, Report, 1905-6. (50 pp.) Nagpur: Secretariat Press, 1906.
- United Provinces.*—Department of Agriculture. Bull. 21:—Some Results of Acclimatization Work at the Saharanpur Botanical Gardens. (51 pp.) Allahabad: Government Press, 1906. 2d.

Ireland—

- Agriculture in Ireland by County Agricultural Instructors. (126 pp.) Dublin: "Farmers' Gazette" Office.

South America—

- British Guiana.*—Reports for 1905-6. Board of Agriculture (19 pp.), Botanic Gardens (23 pp.), Department of Science and Agriculture (7 pp.). Georgetown, 1906.
- British Guiana.*—Board of Agriculture. Report on Lime Cultivation (7 pp.), Rubber Cultivation (7 pp.), and Cotton Experiments at the Botanic Gardens (4 pp.). Georgetown, 1906.

Sweden—

- Tullgren, A.*—Skadeinsekter i Trädgården och på Fältet. (169 pp.) Stockholm: Ljus.

United States—*Bureau of Animal Industry:—*

- Circ. 93. The Life History of the Twisted Wireworm of Sheep and other Ruminants. Preliminary Report. (7 pp.) 1906.
- Circ. 100. A Rapid Method for the determination of Water in Butter. (6 pp.) 1906.
- Circ. 101. The New Meat-Inspection Law and its bearing upon the Production and Handling of Meats. (16 pp.) 1907.
- Bull. 92. The Milking Machine as a Factor in Dairying. Preliminary Report. I. Practical Studies of a Milking Machine. II. Bacteriological Studies of a Milking Machine. (55 pp.) Washington, 1907.

Bureau of Chemistry.—Bull. 104. Food Legislation during the year ended June 30th, 1906. (53 pp.) Washington, 1906.*Bureau of Entomology:—*

- Circ. 78. The Slender Seed-Corn Ground-Beetle. (6 pp.) 1906.
- Bull. 63. Papers on the Cotton Boll Weevil and Related and Associated Insects. 3 parts. (48 pp.) Washington, 1907.

[Books may be borrowed from the Board's Library on certain conditions which may be ascertained on application.]

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and SCOTLAND
in the Month of February, 1907.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	ENGLAND.		SCOTLAND.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per cwt.†	per cwt.†
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots... ..	7 11	7 6	37 3	33 9
Herefords	7 11	7 5	—	—
Shorthorns	7 10	7 2	36 3	33 2
Devons	8 3	7 8	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	8½	7½	9	7
Sheep :—				
Downs	9½	8½	—	—
Longwools	9	8½	—	—
Cheviots	9½	8½	9½	8½
Blackfaced	9	8½	8½	8
Cross-breds	9½	8½	9½	8½
	per stone.*	per stone.*	per stone.*	per stone.*
	s. d.	s. d.	s. d.	s. d.
Pigs :—				
Bacon Pigs	6 10	6 5	6 9	5 11
Porkers	7 6	7 0	7 4	6 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	20 18	17 18	22 2	17 19
„ —Calvers ...	20 16	17 12	20 5	17 0
Other breeds—In Milk ...	18 15	14 7	18 12	15 16
„ —Calvers ...	13 0	11 17	18 19	15 15
Calves for Rearing	2 2	1 13	2 11	1 14
Store Cattle :—				
Shorthorns—Yearlings ...	9 1	7 18	9 3	7 12
„ Two-year-olds ...	13 6	11 16	13 14	12 1
„ Three-year-olds ...	15 17	14 7	15 19	—
Polled Scots—Two-year-olds	—	—	15 17	12 9
Herefords— „	14 7	13 4	—	—
Devons— „	12 12	11 10	—	—
Store Sheep :—	s. d.	s. d.	s. d.	s. d.
Hoggs, Hoggets, Togs and Lambs—				
Downs or Longwools ...	47 6	41 8	—	—
Scotch Cross-breds ...	—	—	36 11	32 8
Store Pigs :—				
Under 4 months	28 9	20 10	21 2	16 10

* Estimated carcase weight.

† Live weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in
ENGLAND and SCOTLAND in the Month of February, 1907.

(Compiled from Reports received from the Board's Market
Reporters.)

Description.	Quality.	London.	Birming- ham.	Man- chester.	Liver- pool.	Glas- gow.	Edin- burgh.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—							
English	1st	50 6	51 0	50 0	—	54 0*	51 6*
	2nd	49 0	46 0	45 6	—	52 0*	46 6*
Cow and Bull	1st	39 0	43 0	42 6	40 0	44 6	42 6
	2nd	34 0	38 6	36 6	35 6	37 6	36 0
U.S.A. and Cana- dian :—							
Port killed	1st	52 0	49 0	46 6	48 0	48 6	—
	2nd	47 0	44 0	43 0	45 0	46 6	—
Argentine Frozen—							
Hind Quarters ...	1st	32 0	32 0	31 0	31 0	32 6	32 6
Fore „ ...	1st	26 6	27 6	25 6	25 6	28 0	27 6
Argentine Chilled—							
Hind Quarters ...	1st	38 6	40 6	38 6	37 6	—	41 0
Fore „ ...	1st	29 0	32 0	29 6	30 6	—	30 6
American Chilled—							
Hind Quarters ...	1st	52 6	52 0	51 6	50 0	53 0	53 6
Fore „ ...	1st	36 6	35 6	35 6	35 0	36 6	37 6
VEAL :—							
British	1st	73 0	—	76 0	79 6	—	—
	2nd	65 6	66 6	69 0	72 6	—	—
Foreign	1st	74 6	—	—	—	—	69 0
MUTTON :—							
Scotch	1st	74 6	70 0	77 0	76 6	72 6	66 0
	2nd	66 6	—	71 6	71 6	62 6	57 0
English	1st	67 0	69 0	73 0	71 6	—	—
	2nd	62 0	55 6	68 0	65 6	—	—
U.S.A. and Cana- dian—							
Port killed	1st	—	66 6	70 0	66 0	—	—
Argentine Frozen ...	1st	37 6	37 6	37 6	36 0	36 0	37 6
Australian „ ...	1st	35 0	36 0	34 0	34 6	36 0	—
New Zealand „ ...	1st	45 0	46 6	46 6	46 6	—	—
LAMB :—							
British	1st	102 6	112 0	—	—	—	—
	2nd	88 6	93 6	—	—	—	—
New Zealand	1st	58 0	54 0	52 6	—	—	—
Australian	1st	45 0	46 0	42 0	42 0	45 0	44 6
Argentine	1st	43 6	43 0	43 6	41 6	—	45 0
PORK :—							
British	1st	60 0	64 0	67 6	67 0	57 0	60 6
	2nd	53 0	56 0	62 0	60 6	55 0	50 0
Foreign	1st	59 0	62 0	61 0	61 0	—	—

* Scotch.

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1905, 1906, and 1907.

Weeks ended (<i>in</i> 1907).			Wheat.						Barley.						Oats.					
			1905.		1906.		1907.		1905.		1906.		1907.		1905.		1906.		1907.	
			s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Jan.	5	...	30	4	28	4	26	0	24	4	24	6	23	11	16	3	18	2	17	3
"	12	...	30	4	28	6	26	1	24	6	24	8	24	2	16	3	18	4	17	4
"	19	...	30	5	28	5	26	1	25	0	24	11	24	1	16	5	18	4	17	5
"	26	...	30	6	28	7	26	2	25	1	25	1	24	5	16	7	18	7	17	5
Feb.	2	...	30	6	28	10	26	3	25	0	25	1	24	4	16	7	18	10	17	5
"	9	...	30	7	28	10	26	6	25	2	25	3	24	5	16	8	18	10	17	7
"	16	...	30	5	28	11	26	7	25	2	25	6	24	1	16	9	19	0	17	7
"	23	...	30	10	28	8	26	10	25	0	25	4	24	2	16	10	19	0	17	9
Mar.	2	...	30	8	28	8	26	9	25	2	25	0	24	2	16	10	19	0	17	9
"	9	...	30	9	28	5	26	8	25	2	25	1	23	11	16	10	18	8	17	11
"	16	...	30	10	28	5			24	11	24	8			16	10	18	10		
"	23	...	30	9	28	4			25	2	24	4			17	0	18	8		
"	30	...	30	9	28	3			25	1	24	5			16	11	18	11		
Apl.	6	...	30	9	28	7			25	6	24	2			17	0	18	11		
"	13	...	30	8	28	11			24	3	24	4			17	6	19	4		
"	20	...	30	8	29	4			24	4	24	0			17	5	19	1		
"	27	...	30	9	29	6			24	4	24	0			17	9	19	6		
May	4	...	30	8	29	10			25	3	23	10			18	0	19	9		
"	11	...	30	8	30	1			24	10	24	1			18	3	20	0		
"	18	...	30	10	30	3			24	8	23	10			18	5	20	1		
"	25	...	30	11	30	4			24	4	24	2			18	8	20	2		
June	1	...	31	3	30	4			23	6	22	10			19	1	20	5		
"	8	...	31	4	30	3			24	0	23	4			18	11	19	11		
"	15	...	31	7	30	4			26	0	23	6			19	1	20	2		
"	22	...	31	7	30	5			23	9	22	10			18	10	20	2		
"	29	...	31	8	30	3			23	2	24	3			19	7	20	1		
July	6	...	32	1	30	2			22	11	23	0			19	6	20	2		
"	13	...	32	3	30	5			23	10	23	8			19	7	20	4		
"	20	...	32	2	30	3			23	7	23	2			18	11	20	5		
"	27	...	32	3	30	5			23	11	22	4			19	3	20	2		
Aug.	3	...	31	11	30	9			22	0	22	1			18	4	19	3		
"	10	...	30	5	30	5			22	5	23	0			16	11	17	11		
"	17	...	28	5	29	0			23	4	24	2			16	4	17	0		
"	24	...	27	1	27	9			23	6	25	0			15	9	16	10		
"	31	...	26	11	25	9			23	5	24	3			15	9	16	6		
Sept.	7	...	27	1	26	4			23	4	24	9			15	11	16	3		
"	14	...	26	11	25	11			23	7	24	3			16	0	16	1		
"	21	...	26	8	25	9			23	10	24	3			15	11	16	0		
"	28	...	26	9	25	9			24	3	24	8			16	1	16	2		
Oct.	5	...	26	9	26	1			24	9	25	0			16	3	16	3		
"	12	...	26	11	26	3			24	10	25	3			16	6	16	7		
"	19	...	27	1	26	6			25	0	24	10			16	7	16	8		
"	26	...	27	4	26	7			24	11	24	10			16	8	16	10		
Nov.	2	...	27	10	26	7			24	9	24	8			17	1	16	11		
"	9	...	28	3	26	6			24	10	24	8			17	4	17	1		
"	16	...	28	7	26	4			24	6	24	4			17	8	17	2		
"	23	...	28	5	26	3			24	6	24	1			17	9	17	3		
"	30	...	28	8	26	1			24	6	24	1			17	11	17	2		
Dec.	7	...	28	6	26	1			24	7	24	1			17	11	17	4		
"	14	...	28	5	26	1			24	5	23	11			17	11	17	3		
"	21	...	28	4	26	3			24	6	24	3			17	11	17	3		
"	28	...	28	3	26	0			24	7	24	1			18	1	17	3		

AVERAGE PRICES of Wheat, Barley, and Oats per Imperial Quarter in FRANCE and BELGIUM, and at PARIS, BERLIN, and BRESLAU.

	WHEAT.		BARLEY.		OATS.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
France: January ...	39 10	39 7	25 0	26 5	21 10	22 11
February ...	40 0	39 7	25 1	26 7	22 1	22 11
Paris: January ...	39 7	40 4	25 5	26 7	22 6	23 2
February ...	40 4	40 2	25 2	26 10	22 8	22 8
Belgium: January ...	30 10	28 9	23 6	25 0	21 9	19 5
Germany: January ...	37 8	38 10	28 6	29 2	22 3	22 8
February...	37 9	39 9	28 0	29 4	21 10	22 10
Berlin: January ...	39 10	39 2	—	—	22 10	23 11
Breslau: January ...	{ 35 6	37 6	25 1	29 7 (brewing) 23 3 (other)	20 7	21 3

NOTE.—The prices of grain in France have been compiled from the official weekly averages published in the *Journal d'Agriculture Pratique*; the Belgian quotations are the official monthly averages published in the *Moniteur Belge*; the German quotations are taken from the *Deutscher Reichsanzeiger*; the prices for the German Empire represent the average of the prices at a number of markets.

AVERAGE PRICES of British Wheat, Barley, and Oats at certain Markets during the Month of February, 1906 and 1907.

	WHEAT.		BARLEY.		OATS.	
	1906.	1907.	1906.	1907.	1906.	1907.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London	29 11	27 7	24 4	23 11	19 5	18 4
Norwich	28 5	26 2	25 2	24 7	18 6	16 11
Peterborough ...	27 11	25 9	24 11	23 1	18 5	16 10
Lincoln	28 8	26 2	25 0	24 3	18 7	17 1
Doncaster	28 6	25 9	25 0	24 2	18 10	17 5
Salisbury	28 10	26 3	26 2	23 9	19 7	17 6

AVERAGE PRICES of PROVISIONS, POTATOES, and HAY at certain MARKETS in ENGLAND and SCOTLAND in the Month of February, 1907.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	London.		Bristol.		Liverpool.		Glasgow.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.	s. d. per 12 lb.
British... ..	15 0	13 6	15 0	14 0	—	—	14 6	—
Irish Creamery	—	—	108 0	104 0	—	—	—	—
„ Factory	96 0	92 0	100 0	96 0	93 6	88 0	—	—
Danish ...	114 6	112 6	—	—	115 0	110 6	114 0	—
Russian ...	99 0	95 0	—	—	—	—	—	—
Australian ...	99 0	96 6	102 6	94 0	99 0	96 0	102 0	97 6
New Zealand...	102 0	99 6	106 6	104 6	104 0	101 6	104 0	—
CHEESE :—								
British, Cheddar	86 0	82 0	81 6	70 6	81 6	78 0	71 6	65 0
„ Cheshire	—	—	—	—	120 lb. 84 0	120 lb. 77 6	—	—
Canadian ...	66 6	65 6	67 0	65 0	per cwt. 66 6	per cwt. 65 0	67 6	65 0
BACON :—								
Irish ...	61 6	59 0	—	—	62 0	57 6	63 6	61 6
Canadian ...	56 6	54 6	57 6	55 0	56 0	52 6	58 0	55 0
HAMS :—								
Cumberland ...	107 6	100 0	—	—	—	—	—	—
Irish ...	107 6	100 0	—	—	—	—	86 0	77 6
American (long cut) ...	62 6	61 0	59 6	58 0	61 0	58 6	62 6	59 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British... ..	13 1	12 1	13 1	—	—	—	—	—
Irish ...	11 8	10 9	12 6	11 7	11 4	10 9	11 3	10 7
Danish ...	13 6	11 11	—	—	12 3	11 3	—	—
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Langworthy ...	82 6	75 0	80 0	60 0	—	—	73 6	70 0
Scottish Triumph ...	80 0	72 6	85 0	70 0	75 0	65 0	—	—
Up-to-Date ...	80 0	70 0	88 6	80 0	70 0	61 6	65 0	58 6
HAY :—								
Clover... ..	105 6	94 6	90 0	80 0	98 0	77 6	85 0	79 6
Meadow ...	100 6	89 6	85 0	75 0	—	—	83 6	78 0

DISEASES OF ANIMALS ACTS, 1894 to 1903.

NUMBER of OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1907.	1906.	1907.	1906.
Swine-Fever:—				
Outbreaks	151	74	298	147
Swine Slaughtered as diseased or exposed to infection ...	694	337	1,301	647
Anthrax:—				
Outbreaks	76	86	148	156
Animals attacked	97	107	202	202
Glanders (including Farcy):—				
Outbreaks	70	73	148	183
Animals attacked	211	143	357	329
Sheep-Scab:—				
Outbreaks	120	91	265	187

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	FEBRUARY.		2 MONTHS ENDED FEBRUARY.	
	1907.	1906.	1907.	1906.
Swine-Fever:—				
Outbreaks	16	4	32	5
Swine Slaughtered as diseased or exposed to infection ...	346	138	567	152
Anthrax:—				
Outbreaks	—	2	—	2
Animals attacked	—	2	—	2
Glanders (including Farcy):—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	4
Sheep-Scab:—				
Outbreaks	53	38	102	100



19 APR. 1906

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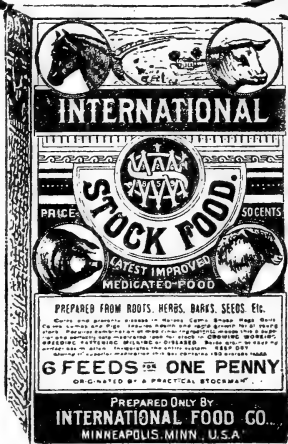
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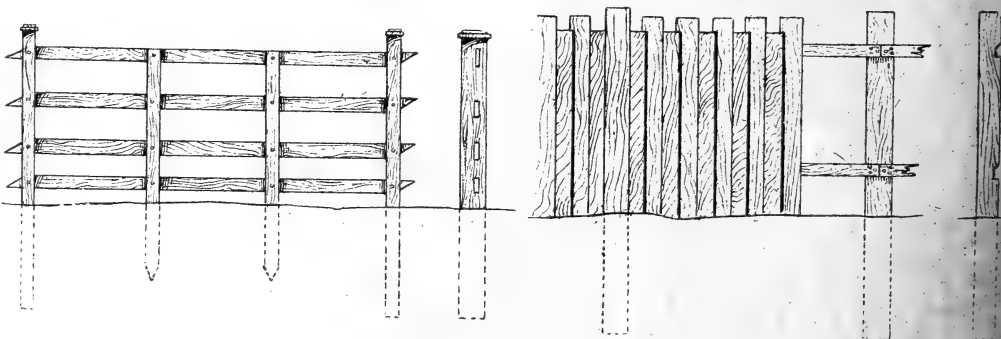
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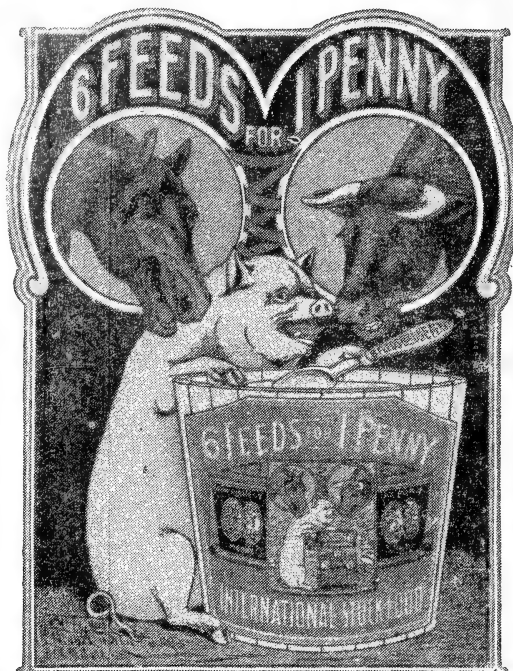
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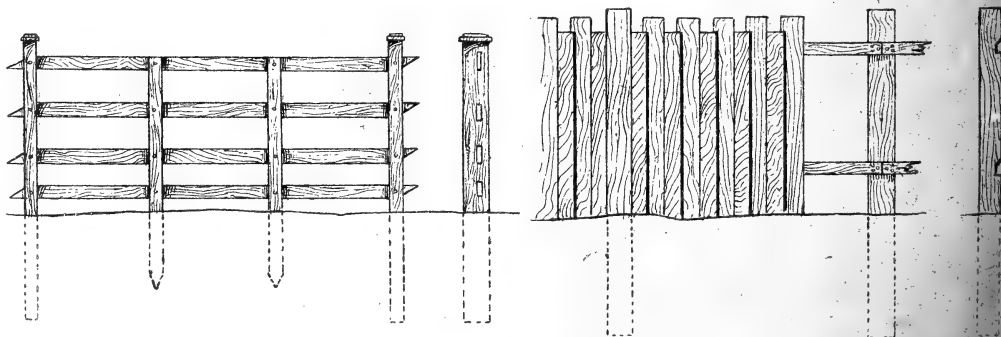
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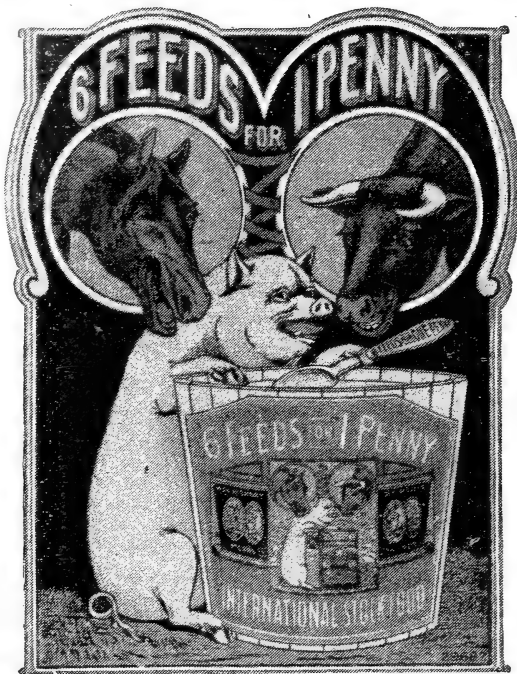
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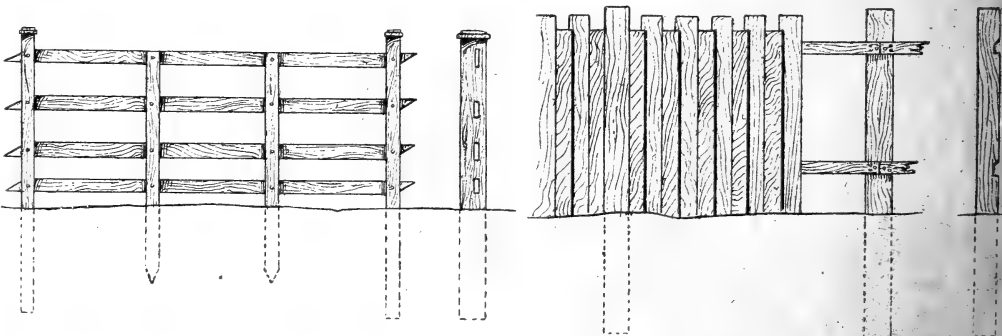
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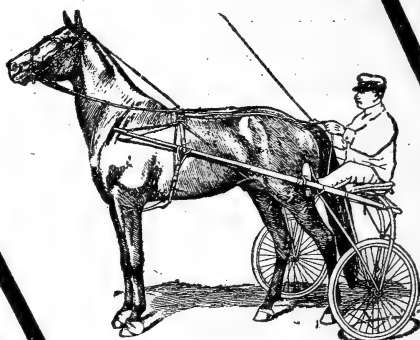
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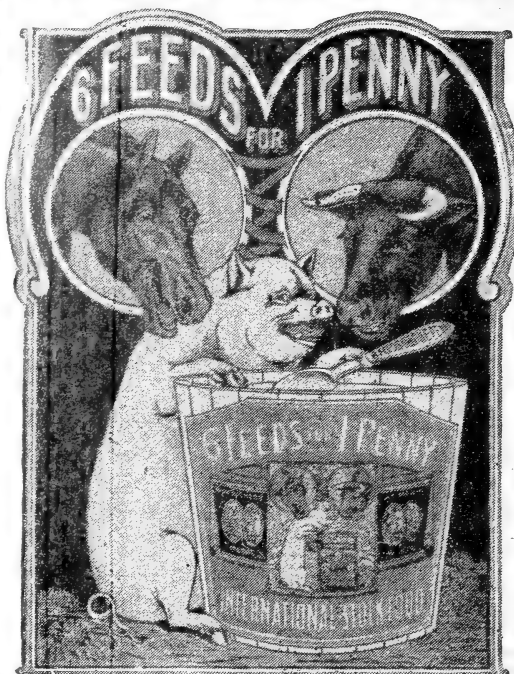
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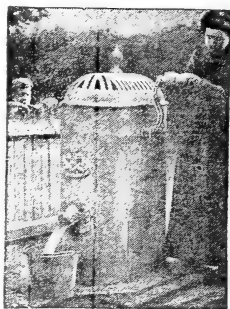
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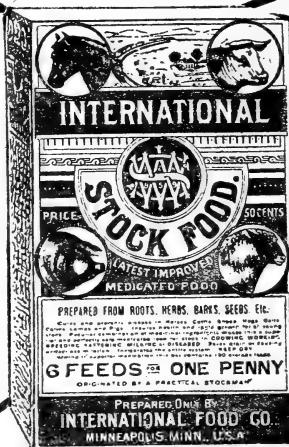
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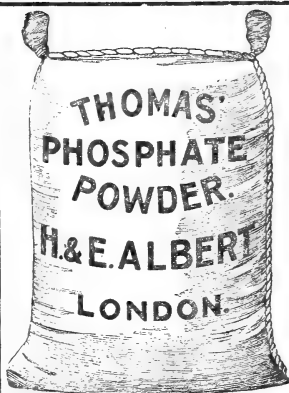
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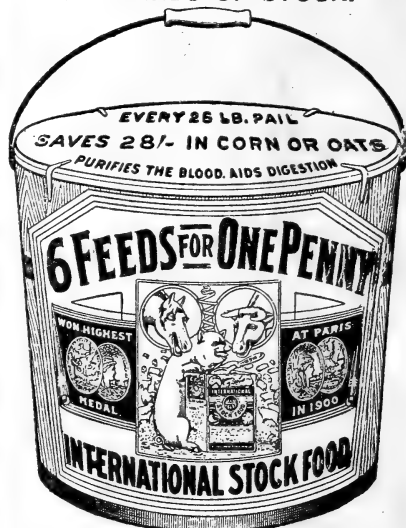
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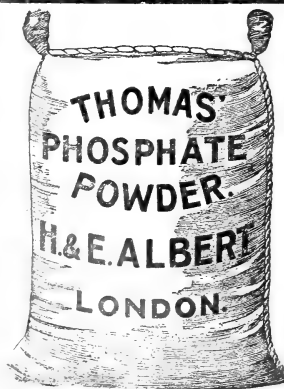
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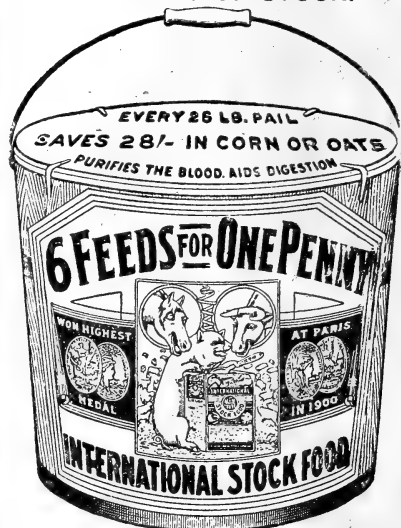
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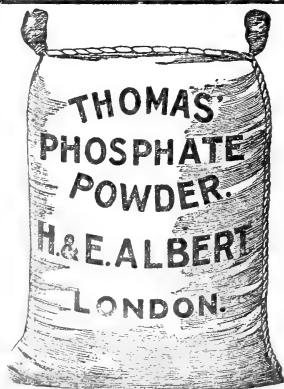
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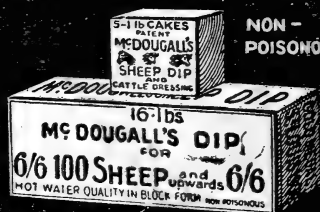
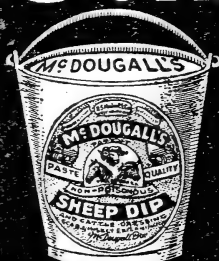
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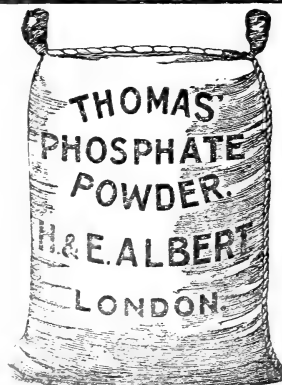
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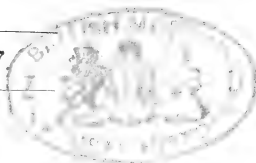
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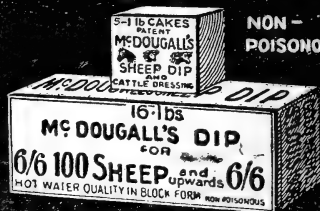
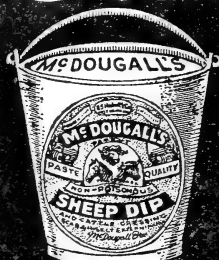
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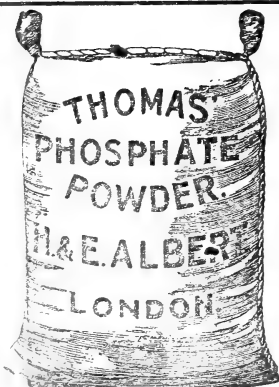
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